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ON THE IMPORTANCE AND PRACTICABILITY OF PROCURING AND PUBLISHING AGRICULTURAL SURVEYS OF THE SEVERAL COUNTIES OF THIS STATE.

One of the earliest measures of the British National Society for the Promotion of Agriculture was to procure correct surveys of the several counties in England, and Scotland. The French Agricultural Societies very early adopted the same course. We mention these examples, because some weight is deservedly due to the opinions and practice of the two most enlightened, and rival nations, of Europe. The result of their efforts has been a more perfect geological, statistical, and agricultural account of those countries, than could have been obtained in any other way. In France, where there are, we believe nearly as many agricultural societies as there are departments, there exist the most ample means of ascertaining not only the character of the soils of the several departments, but of every branch of industry, within these departments. In England, and Scotland, these surveys have been rendered still more perfect, than in France, and they have been deemed of so great importance as to be incorporated in their latest scientific work, the Supplement to the British Encyclopædia. Geography, before these minute surveys, was a very limited science. It gave the boundaries of states, their rivers, lakes, mountains and general produc-

tions, but it furnished little information as to the distinction of these particulars in the several countries, of which it professed to give an account. You might indeed learn that the tin mines were to be found in Cornwall, and the copper mines in Wales, and Anglesea—and iron mines in Dalecarlia, but minute accounts of the geology, and productions of each county were unattainable. There were indeed no means of ascertaining the comparative riches, and power of each district of any state. Yet it cannot be doubted, that such minute knowledge of the productions, and natural advantages of every part of any country is essentially necessary to a sound, and judicious estimate of its resources, and to an advantageous application of these resources to the general good. A county or district might possess articles of great value and importance to its neighbouring districts, but for want of a proper diffusion of the knowledge of the facts, the neighbouring districts might at great, and unnecessary expence, seek from abroad those articles, which they could more cheaply obtain at home. A quarry of slate upon our present system, or of coal, might remain for half a century unknown, or the knowledge of it be confined to the vicinity, but a thorough examination of the soil and productions of every county in the state, and published under the auspices of a general society would soon make us familiar with the capabilities of our country, and thus essentially promote its prosperity. The courses of rivers, and streams, their falls, their capacity to give extension to our increasing manufactures, would be soon made known, instead of the present tardy process of individual exertion. We should also have a much better comparative view of the resources of every part of the Commonwealth, and those portions, which were defective in their agriculture, and manufactures, would learn from those, which were more advanced, and strive to emulate, or exceed them.

It is to be doubted, whether any, the most intelligent man in the state, could give a tolerably accurate account of the soil, productions, agricultural practices, or usages of any one county in the state *except* the one, in which he resides, and it may be questioned whether any man however intelligent is at present able to give a correct account even of his *own county*. Such an account can only be procured by the united efforts of many enlightened men among whom must be included some persons of science. That the natural history of our own state was imperfectly known ten years since is proved by the works of Bigelow, and Webster, and Hitchcock. No man who has read their works can deny, that he has learned much which he did not *know before*, and yet these learned men will be the first to *admit*, that our country has been *as yet* very *imperfectly explored*. It is as true that we are ignorant of the productions of our state in the gross, whether it respects our agriculture or our manufactures. The miserable and defective details taken by the officers appointed to return the census who were paid a per diem allowance, scarcely deserve the name of information.

The most natural course of obtaining this information, the most easy, and the most perfect would be the voluntary exertions of the several local societies for promoting agriculture.

Their employments are now too few for their numbers, and their talents. They require a new and specific object of research to encourage, invigorate and stimulate their exertions. That object will be found in collecting the materials for a statistical history of their several counties—their natural advantages or disadvantages—their improvements in agriculture, and in manufactures, their races of animals—the several breeds which they raise and encourage—whether they have derived any benefit from modern changes in them, and how great. By such an effort, the local societies will have the esprit du corps, the *local pride encouraged*. While

every report will be confined to a fair exhibition of facts, yet knowing, that every neighbouring county will be their rivals, and strict judges, each society will be induced to give as full and favourable an account, as facts will authorize them to do and no more. There will be a struggle also as to the comparative talent which shall be exhibited in the several returns. As these reports will be printed by the General Society, and form a part of the history of the state, the ability with which any particular county report shall be executed, will be known, throughout the Union, and perhaps in Europe. The local societies will probably select the ablest men in every *branch* to give the history of that *branch*. We may hope then to advance by these means more efficiently than we could by any other, the geographical, geological, agricultural history of this state. It is true we have no funds to pay gentlemen for this attention. We have not the 22,000 dollars per annum at the disposal of the British Royal Society—nor have we the aid which has been most nobly afforded by Stephen Van Ranselaer, Esq. for a geological and agricultural survey of the county of Albany, but we offer what in New England is, we hope, enough, *public favour*, and *reputation to the contributors*. We fully believe, that if the local societies will cautiously, and with a deep conviction of its importance name gentlemen of their own counties, to superintend the work, selecting *botanists* for that *branch*. Geologists and mineralogists for these sciences—and intelligent cultivators, and experienced manufacturers for these departments, we may have the pleasure and benefit of having detailed surveys of each county, of which we may be proud, and we pledge ourselves, that this journal shall to the exclusion of all other matter, if it be necessary, be devoted to this important department of knowledge.

As to the benefits which such an inquiry and such publications will confer on the agriculture of the state, we should hope there could be no dissenting or doubting opinions. If

no one man knew, what his *neighbour did*, he never could learn any thing *new* except by his own unaided genius, and as invention and genius are rare gifts, the progress would be necessarily slow. Such is our present state in a considerable degree. We know not the actual state of improvement beyond our own limited sphere. It will be seen, that if our plan, which is that of the English surveys, shall be carried into execution, we shall *know all* that we could wish to know, as to every part of the state.

We have not the sanguine confidence to hope, or expect, that our suggestion will be *at once* carried into complete effect, yet we do hope, that some two or three of the most opulent counties will commence it. We hope that Worcester, Essex, Berkshire and Hampshire will attempt it. If they do not, it will certainly not arise from deficiency of talent in those counties; but we apprehend, from *doubting its utility*. Yet we should ask, in what better mode can you procure a good statistical account of our country? and how can the members of the agricultural societies be more honorably or advantageously employed than by devoting their time to the extension of the means of ascertaining the actual state of industry?

The surveys in France and England have generally extended to the following objects;—the description and natural, and statistical history of the several counties, districts and departments—"Their situation, extent, divisions (such as towns, parishes, &c.)—Form and surface whether mountainous or flat, or partly the one and the other—climate, soils, minerals, waters, including lakes, ponds and rivers—canals, agriculture, including breeds of cattle—agricultural productions, modes of management, manufactures and commerce, population."

Although it cannot be expected, that we shall receive as full returns, and as complete an history as in countries where it is effected by governmental aid, yet we think that our

county societies may if they deem it worthy of their attention furnish very interesting accounts of their respective counties. Where there are gentlemen who are conversant with botany it would be very desirable to add some account of their plants, particularly of their forest trees—and of the state of their forests. It cannot be doubted that such an inquiry would conduce in a greater degree to the knowledge of the true state of our country, and do more towards the advancement of its agriculture than any thing which we have as yet effected. It ought to be known by way of stimulus that the French surveys which have been very ample and satisfactory have been made at private expence chiefly.

SWINE.

[From the New England Farmer.]

The swine or hog is a valuable and useful animal and a number of them is almost as necessary for the farmer as a stock of cattle.—Hogs are not only valuable on account of the meat and fat they afford for the market and home consumption but highly useful in the business of making manure. —It is an indisputable fact that by proper care and attention, a greater quantity of good manure can be made from swine than in any other way with the same expense.

Much exertion has been made within a few years to make our hogs better by introducing new kinds and crossing different breeds and in some instances they have been essentially improved but in others wretchedly depreciated.

A kind have lately been introduced into this vicinity denominated the English breed. I am one among many others who have incautiously ventured to make trial of them to my great disadvantage as they turn out to be inferior in every point to any that I have had before them. I can with the

same expense make one of my old sort weigh at least one hundred pounds more than one of the new kind so that upon a moderate calculation there is a loss of not less than five dollars in each hog of the English breed.

Much credit is due to the committee on swine at our last cattle show on account of their decision between the competitors for premiums.—The gentlemen composing this committee are well known to be practical farmers and well qualified to perform the duty assigned them.—Their judgment was decidedly in favor of the larger kind of hogs in preference to those mouse eared chubs which are to be seen in many of our styes more resembling woodchucks than swine.

The credit of this famous kind of hogs is undoubtedly sinking in this vicinity. Several of my neighbours have lately expressed their disapprobation of them and their preference for a larger kind as being better and much more profitable.—I am determined to be rid of them as soon as practicable and for the time to come be contented with my old sort until I have better evidence than I had before that a new kind is preferable.*

* This statement gives a view of the subject very different from that to which we have been accustomed. We have been told by experienced agriculturists that the breed of swine, originally introduced into this country from England, and which had its origin we believe, from the celebrated Bakewell, has proved a great benefit to agriculturists. That very correct and scientific cultivator, Dr. Fiske of Worcester, stated (in a piece originally published in the Worcester Spy, and republished in the New England Farmer, vol. i. page 107,) as follows:—"My hogs are of the genuine Bedford breed so called in England, and experience has proved to my satisfaction that this breed is far the best that has been introduced into this country. They are quiet in their nature, fat easy, and with little expense or trouble. I have had some weigh at 12 months, about 340 lbs.; and a considerable number, at 18 months old, 400 lbs."

It is possible, however, that the breed, originally excellent, may have deteriorated *for want of crossing*. "Breeding *in and in*" as it is technically called, will in time ruin any breed. See N. E. Farmer, vol. i. page 270.—*Editor N. E. Farmer.*

Swine must have suitable food and enough of it, together with good care and attention in order that they may do well and be profitable. They should always be attended by the same person for if one takes the whole care of them, he will better know what they most need and how much to give them. They should never have any more given them at a time than they will readily eat with a good relish, for if they have more than this it will cause them to become dainty, and lose their appetite, so that frequently they will eat but little more than enough to keep them alive.

The practice of grinding cobs or ears of corn, for hogs, to me, appears to be worse than useless; and were it wholly dispensed with, I think we should see better hogs and hear less complaint about their being dainty and doing so poorly. It is a fact, which I have proved by actual experiment that hogs which have for a considerable time been fed upon good meal, will not at any rate eat that which is made of clear cobs, and very unwillingly that which is made from ears of corn.

My method of feeding hogs is to boil potatoes night and morning during the winter and spring, with which I put a small quantity of meal and give it to them which makes them grow and do well. Through the summer I give them the wash of the dairy, and about the first of September put them to fatting, and give them as much meal as they will eat; and in this way I can make as good pork as any of my neighbours.

A FARMER.

Worcester, May, 1824.

We insert the foregoing article from the New-England Farmer not because we approve of it, but to give us an opportunity of replying to it. We should be the last to prevent or limit free inquiry, as to any subjects of agriculture, but we must deprecate and lament, that spirit, which clinging fondly to old usages, strives to undervalue new improvements,

simply because *they are new*. The tendency of the foregoing article is to produce a retrograde movement in agriculture. Our farmers are sufficiently slow in adopting new improvements, without the aid of essays to warn them against them. If there be any one valuable agricultural novelty introduced into this country, by the inquiring spirit and enterprize of agricultural societies, it is in the breed of swine. We had the materials in our country of improving the breeds of most other domestic animals without recourse to other nations. Care in selection and in rearing our animals would soon have placed us on a footing with any nation in Europe. Our neat cattle were generally good, and individual animals might have been found in New-England which under the skilful management of such men as Bakewell, and Princeps and Champien would in twenty years have rivalled either the Holderness or the Herefordshire races. But as to sheep we were deficient in fine woolled, and in long woolled animals, and it would be as idle to pretend that we could have equalled the merino sheep in fineness of fleece, or the improved Leicester sheep in length of staple as to contend that the Congo negroes could have produced, without a cross, as fair, and fine forms of the human species, as the European or North American.

It is full as true, that we did not possess in America a fine race of swine, and that by no possible art could we have procured it from our *native breeds*. If we have made any improvement in this article, it has been owing to crosses with foreign breeds. Swine are valuable only, or principally, as furnishing food for man. It is therefore more true with respect to them, than even as to cattle and sheep, that those breeds are to be preferred which shew an early and constant disposition to fatten—which afford the greatest quantity of flesh in proportion to offal, and to the quantity of food consumed. It is highly injurious to the interests of agriculture for gentlemen to throw out general surmises against any new

improvement, any amelioration or supposed amelioration of our breeds of domestic animals without thorough and careful and patient experiment; and it is the duty of sincere friends to agriculture not to make assertions simply, but to accompany them with *facts*, and experiments fairly and honourably stated. Has the writer of the foregoing article taken two or more pigs of the old breed and of the new ones, and placed them in the same pen, fed them precisely in the same manner? Has he killed or weighed them at the same age and ascertained, that the new breeds do not give as much pork as the old ones? *If he has so done let him state the facts.* What was the new breed he raised? Was it the Bedford, or the Wellington, or the Scotch breed, or was it a cross? From whom, did he procure the breed, and is he sure it was of an *approved race?*—When we have these facts, we can come to a decision much better, than on anonymous authority, and general assertion.

But should the writer of this article have been so singularly unfortunate, as to find a breed of hogs of recent introduction, inferior to our old most expensive, and unprofitable race, we can tell him, where he may find hundreds of persons, who have been more successful.

We have tried the new races against the old, with the same treatment, and we have found uniformly, that the improved breeds gave double the quantity—double the weight of pork in the same number of months, which the old race gave, and with about one third less food.

But the writer of this article has only managed on a small scale, he has however witnessed the effects of the new breeds on an extended one. Is it pretended that the new breeds want *size?* They have often weighed when slaughtered 700 pounds—Ordinarily at 18 months they weigh from 4 to 500. The advantages they furnish are more *consumable* food in proportion *to their whole weight: flesh on those parts where it is wanted, and a greater proportion of fat*—and *this too with less food.*

It ought to be known, that the breeds have been constantly *improving*. The first improvement was the introduction of the Byfield and Bedford. This has been followed by that of a new English breed, called the Wellington—and a Scotch breed, the Sire, of which, here, is called Dalhousie. These last breeds, and their crosses, have surpassed any which we have heretofore had. But that we may put an end to debate, so far as the best authority on such a question may go, we shall mention the opinion of one of the most extensive packers of pork in the United States—a man of sound and excellent judgment, out of his immediate employment—who perhaps has seen more slaughtered hogs, than all the farmers in the county of Worcester put together, for he has been extensively concerned in packing pork, and making hams for thirty years.

Mr. Edmund Winchester has said, that the improvement in the breed of swine, (alluding to the new breeds) within a few years is richly worth to *Massachusetts only*, the sum of one hundred thousand dollars. This simple fact, this simple opinion, of the greatest purchaser will and ought to go further with our farmers, than hosts of individual opinions of raisers of swine, who could only have their own experience or that of their own vicinity, and that experience perhaps not very carefully considered.

[Communication.]

HYDRAULIC RAM.

A MACHINE FOR RAISING WATER.

Some of the readers of the Repository may be benefited by the following account of a foreign invention not much known in this country, called the Hydraulic Ram. It is a machine of apparently simple construction, by which water may be raised to any height for the purposes of irrigation

and domestic use, by means of a small head or fall of water, in low grounds. The command of a stream or pond, which will yield a foot fall will enable the possessor to conduct a portion of the water to an elevation of several hundred feet. What portion, will depend upon the relative height of the fall and of the reservoir. Before we give a description of the machine, and the mode of its operation, it may be well to say something of its history and of the estimation in which it is held abroad. Dr. Young, in his Lectures on Natural Philosophy and the Mechanic Arts, Vol. 1. p. 337, 338, speaks of the invention in the following terms. His account is principally valuable for the historical notice at the close; for although he states the principle correctly, his description of the operation of the machine is imperfect.

"The momentum of a stream of water, flowing through a long pipe, has been employed for raising a small quantity of water to a considerable height. The passage of the pipe being stopped by a valve, which is raised by the stream, as soon as the water becomes sufficiently rapid, the whole column of fluid must necessarily concentrate its action almost instantaneously on the valve; and in this manner it loses the characteristic property of hydraulic pressure, and acts as if it were a single solid; so that supposing the pipe to be perfectly elastic and inextensible, the impulse must overcome any pressure, however great, that might be opposed to it, and if the valve open into a pipe leading to an air vessel, a certain quantity of the water will be forced in so as to condense the air, more or less rapidly, to the degree that may be required for raising a portion of the water contained in it to any given height. Mr. Whitehurst appears to have been the first that employed this method: it was afterwards improved by Mr. Bolton; and the same machine has lately attracted much attention in France under the denomination of the Hydraulic Ram of Mr. Montgolfier."

Joseph Montgolfier of Paris long known in France for his

ingenuity and skill in the mechanic arts, claims to be the inventor of the Hydraulic Ram. An account of it was published by him at Paris in 1805, in a pamphlet form. In this publication he speaks of it as being already in use in various parts of France and in some other parts of Europe.

To raise water above its source by machinery so as to have the use of it at less cost than it is worth when obtained has been always a desideratum where a great quantity has not been wanted. To feed a distillery or a large brewery, where water must be had at all events, the expense of procuring it by horse power or by steam is an item of the necessary expense of the manufacture for which the establishment must be indemnified in the price of the liquors. But when the question is of a supply of water for irrigating lands—for the use of the farm yard and for domestic purposes, forcing pumps, bucket wheels and machinery to work by wind are almost universally rejected as too expensive. Feeling the force of this objection to all kinds of machinery heretofore in use for such purposes I applied myself, says Montgolfier, to discover some other mode, to which this objection could not be made, aware that I could hope to succeed only by the aid of some new principle. This he obtained and has applied with entire success. The power employed is two-fold. 1st. The momentum of a water fall. 2d. The expansive power of a body of air confined in an air chamber.

Fig. 1. in the Plate gives a section of the machine as described by Joseph Montgolfier. A Q represents one side of a Box by which the water descends. B the cone through which the water passes into the tube C D which may be either of cast iron or copper. It rests on a piece of timber its whole length and is firmly fixed in mason work at both ends. The height of the fall in the drawing, is supposed to be four feet, and the tube C D twelve feet.

At the end of the tube C D is attached what is called the Ram's head. This part is also either of iron or copper. In

it there are two openings—one at O which may be closed by the valve G, ascending. The other I which may be closed by the valve K, descending. Both these valves are guided by iron rods which pass through their centre.

The orifice at O opens into a chamber R which is called the air chamber. Towards the bottom of this is an opening to which is fitted a tube L U which is to receive the water to be raised, and the length of which is according to the height to which the water is to be conducted. The head of the machine is firmly fixed in masonry H.

When the machine begins to operate, the orifice O is open and the water as it descends and passes through the tube C D flows out at first freely at O and runs to waste. But soon the water acquires an augmentation of velocity sufficient to press up the valve G so as to close the orifice O. The water in the long cylinder B C D O is thus suddenly arrested in its course and reacts with a force which opens the valve K, and gains a passage for the water into the air chamber R. The communication with the atmosphere by means of the tube L U is cut off by the water which enters the lower extremity of this tube. The valve K is immediately pressed down by the weight of water above it. As soon as the water has found a vent at I, the pressure of the water upon the valve G being removed, the water begins again to flow out to waste at O, and the whole process is again repeated. The water which is thrown into the air chamber through the opening at I, compresses the air confined in it, and the air by its expansive power forces the water into the tube L U, and to any given height. The time required for the entire process is from half a second to three seconds according to the size of the machine, &c.

Water has been carried by this machine to a height of 1280 feet. The weight of this column of water is equal to 40 times the weight of the atmosphere. Of course the air in the air chamber was reduced in compass to a fortieth

part of the space it would occupy when free. In the subjoined notice is an account of one of these machines in use in Switzerland.*

It will be readily understood that every part of a machine like this should be of great strength and well constructed. The thickness of the cylinder B C D should be double that of the ascending tube L U. The thickness of the latter in proportion to its diameter and height. It should be observed that if the elevation to which the water is to be carried be very great the ascending tube need not be of equal thickness throughout; it is only at the lower part of the tube where great strength is required.

It has been ascertained that a tube of sheet lead the twelfth of an inch thick and an inch in diameter, will support a column of water fifty feet in height.

An inch tube of copper will support a column	400 feet.
Do. of brass	300 feet.
A tube of cast iron two inches diameter and one third of an inch thick, will support a column	500 feet.

If the ascension tube is to be bent in its course towards the reservoir, the turns should be as little abrupt as possible, in order that the water may pass freely.

As respects the cost of the machine, this varies of course

* The Hydraulic Ram of Mr. Montgolfier has been constructed at Schaffhausen by Counsellor Fischer in a very ingenious manner. The machine has the form of a beautiful antique altar. A basin, about six inches in depth and from eighteen to twenty in diameter, receives the water, which enters into pipes three inches in diameter, that descend in a spiral form into the base of the altar. The water by its weight puts in motion a valve; a third nearly of the water escapes, but the rest is forced into the receiver, and thence rises in very narrow pipes. As it ascends slowly the resistence of the air makes no sensible impression, so that by means of this machine, which continually acts by itself, water may be conveyed from a lake or a river to houses situated on a mountain. Mr. Fischer has conveyed water by it to a castle which stands at the height of several hundred feet above the level of the Rhine. *Tilloch's Philos. Magaz. Vol. 20. p. 92.*

according to circumstances. It may however be said in general terms that this will depend, 1st. Upon the quantity of water to be raised. 2d. The elevation of the reservoir. 3d. The distance of the reservoir. 4th. It will be less, in proportion to the height of the fall.

A few examples will afford a better idea on this point. Suppose the quantity of water to be obtained be a stream of one inch diameter.*

First example. Fall 6 feet—Elevation to which the water is to be carried 20 feet. Price $24.

Second example. Fall 4 feet—Elevation to which the the water is to be carried 50 feet. Price $250.

This estimation to be doubled for local and incidental expense in placing the machine. This is the rate of expense in Paris, as given by Mr. Montgolfier.

The cost of repairs hardly need be calculated. Unlike most other machines for the same use, this requires little cost to keep it in order.

When the height to which it is desired to raise the water does not exceed ten feet, a fall less than a foot will be sufficient; even six inches will be enough.

Some have imagined that by the aid of the Hydraulic Ram, the water employed to turn a wheel might be reconducted to the pond above. This is an error. The power employed cannot be made to reproduce itself.

This machine will raise not more than half the water employed to set it in motion—the rest will run to waste.

To ascertain what proportion the quantity of water which can be obtained at a certain elevation bears to the water which passes into the machine, double the number of feet of this elevation, divide by the number of feet of fall, and the quotient will be the relative quantity.

* A stream one inch diameter will give 14 quarts per minute, equal to 34 hogsheads in 24 hours. Each inch contains 144 lines. A stream whose diameter is one line will supply 35 gallons of water per day; sufficient for the ordinary use of one family.

In the year 1816 eleven years after Joseph Montgolfier's first publication, a patent was granted in England to Pierre François Montgolfier for an improvement on the original machine. Figures 2 and 3 of the Plate are given by him to illustrate his specification, which is here copied that a perfect understanding may be had of the latest improvements, upon a machine which appears to have strong claims to the attention of the people of this country. We copy from the Repertory of Arts, vol. 30.

In figure 2. The large pipe A B is called the body of the Ram; the end A is carried through the wall or bank of the reservoir, river, or other supply of water, the other extremity R, of the pipe, has an opening H H, capable of being closed by valves C or D; but when the said valves are open, the water of the reservoir will run through the pipe A B and issue freely through the valves C D, with a velocity proportionate to the height of water in the reservoir above the orifice H H of the valves, through which the water makes its escape or rather above the level of the standing water in which the whole machine is immersed up to the level of the dotted line X, so that it just covers the valve D.

The end A of the pipe which receives the water of the reservoir is formed like a trumpet-mouth, that the water may flow more readily into the pipe; and the length of the pipe A B must be regulated according to the height of the fall of the water which is to produce the current through the pipe. The pipe is composed of several pieces or lengths, screwed together by flanches, or other similar means; but it is in the end piece B R, which I call the head of the Ram, that the moving parts of the machine are placed. The extremity of the pipe or head of the Ram terminates with a portion of a sphere R, in the upper surface of which is a large circular opening, to receive and hold the seat of H H, the valves C D, at which the water issues; but when the internal valve C is closed, as in the figure, it prevents the water from issuing.

When the valve C opens, it descends into the position of the dotted lines G, and leaves a free passage. Its motion is guided between three or four stems g, which have hooks formed at the lower ends, to retain or support the valve, when opened; and these stems are fixed by screws, so that they can be regulated to allow the valve to open a greater or less passage for the water. The valve C is made of metal, and hollow, for it has a hollow cup or dish of metal attached to its lower surface. This at the same time renders the valve lighter in the water, and gives it a convex surface, which (when it is open as shown by the dotted lines) corresponds with the interior concave surface of the spherical end R of the head of the Ram. The seat of the valve which is marked H, is composed of a short cylinder or pipe, of which the opening is much greater than the transverse section of the pipe A B. This short cylinder is screwed by its flanch h h into the opening of the upper surface of the head R of the Ram. The said valve seat H H is so formed as to have an inverted cup around the upper part of the short cylinder; that is a circular channel or annular space i i, which will contain air and from which the air cannot escape when the water compresses it. k l is a small pipe, leading from the said annular space to the open air; it is furnished with two small valves, one at K opening inward, to admit the air to enter into the space, but to prevent its return; and the office of the other, at l, is to admit a certain quantity of air, and then to shut and prevent any further entrance. D is a valve similar to C, but shutting down on the outside of the seat H H; its use will be hereafter explained.

The upper part of the head of the Ram at E is made flat and has several narrow openings across it, which are covered by valves E, to allow water to pass out from the pipe A B, but to prevent its return. And on each side of the head of the Ram, at the part opposite to the valves E, is a hollow enlargement as is shewn by the dotted lines K in Fig. 2 to

form a circular basin, through the centre of which the pipe A R of the Ram passes, as is shewn by the transverse section in Fig. 3. But the pipe instead of being circular is flat at top, at that part, to form the seats of the valves E. This basin is covered by an air vessel F, screwed down by means of a flanch round the edge thereof. All the water which issues from the pipe through the valves E will flow off on each side and be received in the basin K. There is a passage L communicating from one of the enlargements to the other; for which purpose it curves down and descends beneath the pipe of the Ram; and the pipe M Fig. 3 that carries away the water which the machine raises, must proceed either from this passage or from some other part of the basin K, so as to receive the water which has passed from the body of the Ram through the valves E and the air vessel, into the basin K K.

The action of the machine is as follows. Suppose the pipe full of water. If the valve C is opened, the water from the reservoir will flow through the pipe A B, and issues through the opening H, it will lift up the valve D, and escape; but the current having continued until the water has acquired a certain velocity, the force of the current buoys up the valve C, and closes the passage; the motion of the water contained in the pipe A B will thus be suddenly arrested, and by its *vis inertiæ* or moving force, it will exert a sudden pressure against the valve C and against all the interior parts of the pipe. The small quantity of air contained in the space i i compresses into a smaller space, and by its elasticity takes off the violence of the shock or blow which would otherwise be produced. This pressure opens the valves E, and a portion of the water will be driven into the air vessel F, which is supposed to be full of air, compressed or condensed, till its elasticity equals the pressure of the column of water which is to be raised up the pipe M by the action of the machine.

The water which is forced into the air vessel causes the air therein to be condensed to a greater degree of elasticity and

it will exceed the pressure of the column of the water in the pipe M; by degrees the air will therefore force through the said pipe M all the water which was injected through the valves E, and cause that quantity of water to issue from the upper extremities of that pipe. The moving force, or *vis inertiæ*, of the mass of water, which was in motion in the pipe A B, having expended itself by forcing a portion of the water into the air vessel, and making a still greater compression of the contained air, a recoil of the water in the tube will take place with a slight motion from B to A, this arises from the reaction or elasticity of the air contained in the space i i, and also of the metal of which the tube is composed. The valves E shut and prevent the return of the water which has been forced into the air vessel. This recoil of the water in the pipe towards A causes a slight aspiration within the head of the Ram; and the valve D having descended by its weight, prevents the water X with which it is covered, from entering through it; but the air passes through the passage l k, and opens the valve k; and a small quantity of air is sucked into the space i i; but this is a very small quantity, because the valve k closes as soon as the air flows with a rapid current through the passage. During the recoil the valve C, having nothing to sustain its weight falls and opens the passage, and as soon as the force of the recoil has expended itself, in acting against the column of water contained in the reservoir, at the end A, the water begins again to flow through the pipe from A B, and repeats the action which I have described—viz. it shuts the valve C when it has acquired the intended velocity, and being thus stopped, the *vis inertiæ* condenses the air at i i, and opening the valves E, forces a quantity of water into the air vessel, from which the reaction of the contained air will drive it up the pipe M. The *vis inertiæ* of the moving column of water, being thus expended, the recoil commences by the reaction of the air at i i; the valves E shut, and the valve D likewise, the aspiration produced by the recoil draws some

air through the valve k l. The valve C falls by its weight, and opens the passage, so that the water in the pipe A B can resume its motion when the recoil has exhausted itself.

The small quantity of air which is drawn into the machine, through the air valve l k, at each aspiration, causes an accumulation of air in the space i i; and when the aspiration of recoil takes place, a small quantity of air passes from the space i i, and proceeds along the pipe till it arrives beneath the valves E, and lodging in the small space between those valves, it will be forced into the air vessel at the next stroke, by which means the air vessel is always kept filled with air.

The machine represented in the drawing is calculated to raise water up the tube M 100 feet above X. When the fall by which it is worked is five feet, that is the difference of the levels Y and X of the water in the reservoir and the lower level X, the length of the pipe A B is to be fourteen feet long from A to B, and six inches in diameter. The dimensions of all the other parts may be found by the scale. Such a machine may be expected to expend about seventy cubic feet per minute to work it, and to raise up about two and one third cubic feet *per* minute; but these quantities cannot be exactly stated, because they depend upon the care and accuracy with which the machine is constructed. Under different circumstances having a greater or less fall, or quantity of water, the dimensions of the machine must be calculated accordingly.

The hydraulic ram, represented in Fig. 2 and 3 is adapted to give motion to the hydrostatic presses which are in common use under the name of Bramah's presses. For this purpose it is only necessary to apply the pipe M, (Fig. 3,) to the cylinder of the hydraulic press, and at each stroke of the ram, a small quantity of water will be forced or injected into the cylinder of the press, and will thus produce the ascent of the piston of the press, in the same manner as is now performed by the small injection pump worked by the force of

men. But by the application of my improved hydraulic ram to that purpose, the press can be worked in any situation where there is a small fall of water, and the ram may be set in motion whenever the press is wanted.

The specification so far contains not only the improvement by P. F. Montgolfier, but also a general description of the Hydraulic Ram and its mode of operation. Those who may wish to ascertain the nature and extent of these improvements and the uses of them, are referred to Vol. XXX. of the Repertory of Arts, which may be seen at the Boston Athenæum. They will there find that by these improvements the machine is fitted to give motion to various kinds of machinery for manufacturing purposes to a limited extent.

The surface of our state is broken and abounds in water falls more or less elevated. It will be seen at once that those which are not high enough to afford mill power, and are turned to little or no account, and, in many instances, carry a supply of water sufficient to irrigate the adjoining hills in a time of severe draught, offer a resource by the aid of the hydraulic ram which may change the character of a farm and enable it to yield abundant crops where none such are now or can be by other means obtained. The expense of wells in some parts of this commonwealth is enormous, where, nevertheless, streams with small falls flow at no great distance and within a hundred or perhaps thirty feet of the elevated spot where water is thus difficult to be gotten. The hydraulic Ram in such cases might come cheaper than the cost of a well and pump, with the further advantage of its yielding a constant supply without manual labour. Our country is subject to severe summer drought, and often while the hills are parched and wells are failing, some deep valley at no great distance affords a perpetual spring with perhaps a natural fall of a few feet in its course; if not a natural fall, it may be so situated that an artificial one may be had with little labour. Under such circumstances, in

some cases, the hydraulic ram might be of invaluable advantage.

In the No. of the Massachusetts Agricultural Journal for January 1822, will be found General Hull's interesting communication on irrigation. Though the benefits from this source to the farmer are familiar to most, we think it may be useful to repeat here the closing part of his remarks, as they place in a strong light one of the most important applications of the Hydraulic Ram.

"Those fields which were dry, and without hardly a blade of green grass, after the first mowing, are now at that season covered with the richest verdure. Such parts of my mowing grounds, as I have irrigated, without carrying on any manure, excepting what was carried on by the water, have greatly increased, both in the quantity and quality of the hay; and according to my best opinion, there will be no occasion of breaking up the land, as long as the operation of the water is continued. Some parts of the land, which I irrigate, I have manured, and have found myself amply remunerated. The coarsest and rawest manure, retaining all its strength, may be put on these lands, in the fall, early in the spring, or after the first mowing and the water not only prevents it from burning the grass, but decomposes it in such a manner, that it has a greater effect, than when it is old, and some of its virtues have evaporated, as will be the case when exposed to the sun, and the air in its preparation. When history informs us of the great advantages, which the earliest nations of which we have any account derived from fertilizing their lands by water; when it is considered in what high estimation it is held in every part of Europe, and indeed in other parts of the world; and from the few experiments which have been made in this country, what vast advantages might be derived from it, is it not matter of surprise, that more attention has not been paid to it here, and that it has hitherto remained without any patronage? In Switzerland, the first

agricultural society grants it the first premium. I believe, there is no country on earth, better calculated for improvements, by this means, than ours. Streams almost innumerable pass over it, in their natural courses, and have carried and continue to carry, the richest part of the soil into the ocean. This rich manure, which is now entirely lost, with little expense, and without the aid and labour of dung carts, might be spread over our cultivated fields, and render them productive, beyond any calculation that the most sanguine can imagine. Yet we stand, uninterested on their banks, gaze at them as they pass, without an effort to regulate their courses in such a manner, as to reap the advantages of the rich treasures, they contain. It is certainly a neglect of a blessing, which a munificent Providence has provided and offered for our acceptance."

ON MILLET.

This plant has become so much an object of notice and culture in every part of the United States, at least from the state of Maine to Virginia, that it seems proper that it should have a more particular notice in this Journal, than it has as yet received. We have been more cautious in recommending it from the well known fact, that new plants often receive great and unbounded praise, from those who introduce them, and afterwards many of them are suffered to pass into neglect, as experience shall have proved them to be of little value, and sometimes even pernicious. There are innumerable examples of this sort in the history of agriculture. We might mention burnet, which had a great run for a short time in England, and was puffed in our own country, but nobody ever speaks of burnet, at present, as an article of culture. We might mention chiccory, or succory, which was intro-

duced into New England as a valuable article of fodder, and has proved to be only an useless weed, rather troublesome, but chiefly confined to our highways, where it is left to display its beautiful blue flowers uncropped, even by hungry cows, turned adrift to snatch their food on public commons. Shall we add the fiorin grass? Perhaps we ought not to do it so soon, out of respect to the Rev. Dr. Richardson, yet it is but proper in an agricultural work to say, that Fiorin grass has ceased to be an object of discussion and interest in Great Britain, and we have never heard of one successful attempt to cultivate it in America. Our white weed, chrysanthenum, now considered as the bane of our farmers, is said to have been introduced as a valuable grass; and more recently Mr. Charles Whitlow, professing to be a botanist, urged the cultivation of a species of nettle, in lieu of hemp, to which species he affixed the name of Urtica Whitlowii, in the fond hope, that his name would be handed down as one of the benefactors of mankind. But we have never heard of *nettle* hemp.

What then are we to infer, from these facts? Are we to entertain distrust for all *new* plants? Certainly not. It follows of course, in agriculture, as in the mechanic arts, that there will be at least ten failures to one successful discovery. The zeal for improvement will urge man to experiments. Every man, who believes he has discovered, or introduced a valuable article, will praise it. It will be submitted to the only fair test, experience. If it succeeds, the discoverer will be honoured. If it fails, nothing has been lost by society but the expense of the experiment. The potatoe has been lately discovered in its native haunts. It was till then an unsolved question, to what region we owed this blessing. It was ascribed to Virginia, but in Virginia it is not to be found. It was ascribed to Mexico, but Humboldt could not find a trace of it in Mexico. It has however been found in Chili, but in Chili, though identically the same plant, its tubes or roots are bitter,

and small. Is not the discovery of the potato which gives to five millions of men an ample recompense for hundreds of abortive and fruitless trials, to introduce other plants? The Beta Alba, or mangel wurtzel has stood its ground for fifty years, and this country ought not to be willing to give up its share of the benefits arising from its introduction for one million of dollars. The Ruta Baga, or Swedish turnip, will also probably stand its ground, and maintain its ascendancy over the common turnip, though there is more doubt on this point than on the other.

Will the Millet continue to be cultivated? Does it deserve so to be? These are questions which we do not propose to solve, but we intend to place the history of the cultivation of *this East Indian plant* on its true ground, to give a brief abstract of its culture in Europe and America. The Millet has been long known in Europe. It is noticed very briefly in the first edition of the British Encyclopædia under the name of Milium, and was ranked among the Grasses. By the later botanists, it has been considered as a Holcus; and its botanic appellation, according to Turton's Linnæus, is "Holcus Sorghum." By the Editors of the Encyclopædia, it was spoken of very slightly, and praised chiefly as furnishing good food for fowls. The American agricultural writers seem to have copied the remarks of the Encyclopædists. Deane, in his Dictionary, speaks of it chiefly as affording a grain well adapted for poultry, and the "Farmer's Assistant" does not assign it a higher place. Neither of them mentions it as fitted for green and dry fodder for animals on an *extensive* scale. At the outset, it is worthy of remark, that it is somewhat singular, that, since it has been known in Europe 200 years, it should not have become an object of more and deeper interest. If it be said, that Great Britain is too cold for it, yet it must be seen, that it ripens its seeds there, and 50 years since, they were used as the food of poultry, and esteemed as such. But if England is too cold, surely Lan-

guedoc and Provence, and Lombardy, and Tuscany were not. Why has it not acquired more celebrity there? Lest it should be inferred from these remarks, that we are not friendly to its culture here, we expressly affirm the reverse to be the fact. Our own experience is favourable to it, but we cannot but express our surprize, that other nations do not see it in the light that we do. Is it that we alone have first tried it as fodder, while all Europe have only looked to it, as grain? These singular facts are noticed solely with the view, that our intelligent cultivators should have the whole subject before them. It is much more proper to submit the evidence to their understandings, than to recommend an article on our own authority, or on that of any man, however respectable. The first knowledge, we possess of the cultivation of millet in this vicinity, was derived from an experiment made by a very respectable and intelligent gentleman of Boston, Dr. W——r, who gave to the public the result of his trial, which was a favourable one. It established the fact, that this plant could be grown to perfection in our climate. Some years elapsed, however, before any extensive trials were made. Many undoubtedly have been made which have not been communicated to the public. We shall mention those only which we personally know. The Hon. Mr. Quincy has for several years raised this plant on a considerable scale, not to such an extent as would in the Southern States be deemed considerable, but certainly so on the limited scale, in which the culture of New England is conducted. Our farms are much smaller than those of the Southern and Middle States, and our experiments of course are more limited. It is the prevailing opinion with us, that a little land well cultivated and thoroughly manured, yields a greater profit than much land indifferently treated. Mr. Quincy principally employed his crops of millet for the soiling of his cattle, and his success we have reason to believe was complete. He also converted some of it into dry fod-

der with success. John Prince, Esq., Treasurer of the Massachusetts Agricultural Society, has also tried this plant with great success. Dr. Aaron Dexter, late President of this Society, and one of its present trustees, tried the millet under circumstances which tend strongly to recommend it. He sowed it as late as the beginning of August, and cut and dried it as fodder, and found that it produced a very heavy crop. It has been tried by other farmers in this vicinity with success. We shall now introduce the experiments of Southern farmers as related by themselves. The following letters from John Hare Powell, Esq. will be read with interest.

FROM THE PORT FOLIO.

I have made many experiments on various soils, and at different seasons, to ascertain the product, as well as the properties of Millet. Upon light land, in good condition, it succeeds best; it requires in all cases, fine tilth, and as much strength of soil as is necessary to produce heavy oats. I have not seen, either in Europe or America, any green crop, which so largely rewards accurate tillage and plentiful supplies of manure, as the species of millet usually grown in this and the adjacent counties. I have sown it from the first of May, to the 20th of June, and have invariably obtained more fodder than could have been had from any grass under similar circumstances. In the autumn, eighty bushels of *caustic* lime per acre, were strewed upon an old sward, which was *immediately* ploughed, closely harrowed, sown with rye, and rolled—the rye was depastured in the winter and succeeding spring. Early in April the land was ploughed again; the lime and decomposed vegetable matter was thus returned to the surface. About three weeks after it was harrowed, to destroy weeds; early in May it was again harrowed for the same purpose—within a fortnight it was stirred with Beatson's Scarifier, to the depth of nine inches, harrowed, sown with

Millet, and rolled. The crop was fairly estimated at three tons per acre. After the millet was cut, the field was stirred, and repeatedly harrowed, to destroy the after growth of noxious plants. I intend to again sow rye, not only to obtain pasturage, but to protect the soil from the exhalations of the sun. In the succeeding spring, a slight dressing of fresh manure was ploughed under; the scarifier, roller, and harrow were used at intervals as before. On the 5th of May, five bushels of millet seeds were sown on four acres—on the 5th of July the crop was hauled, and estimated at four tons per acre. I have obtained this season, forty tons from sixteen acres, of which four only had been manured, the remainder could not have borne a good wheat crop. One of the loads was weighed; an account of them was regularly kept; their size was made as nearly equal as possible. I have generally used a large quantity of seed, as not more than two-thirds of that which is usually sown, will vegetate. Whilst my oxen consumed millet in its green state, they performed their work with more spirit and vigor than they had done before, or have shewn since, except when fed with grain. My cattle, of all ages, prefer it to both red and the best white clover, meadow or timothy hay.

I am not disposed to cultivate it as a farinaceous crop, since I have found great difficulty in protecting it from the ravages of immense flocks of birds, which it attracts, and in securing it sufficiently early to prevent a large part of the grain from being left on the ground. The seeds on the upper parts of the stalks, generally ripen, and fall, before those below have been filled. I therefore invariably cut it, when the upper parts of most of the heads contain seeds, which are hard. All my observations have confirmed me in the belief, that in this stage it affords fodder, more nutritious, and more easily made, than any sort of hay. The expense of tilling the land, in the accurate manner which I have detailed, is not so great as at first view would appear. A yoke

of good oxen can scarify three acres and an half, without difficulty, in one day. I would recommend millet, not merely for its value as a food, but for the means it affords of making clean the land, without summer fallows, or drill crops. The ingenious arguments which have been adduced to prove, that deep stirring between growing crops is advantageous to them and the soil, are founded upon English experience, properly directed by close attention to the effects of a moist climate. Some of our writers have profoundly asserted, that as "deep drops" are found on the underleaves of plants after deep stirring has been given in time of great drought, the practice is sound. I should suggest, if I were allowed, that moisture had better be at such times, conveyed to the roots, than be exhaled by the sun, or placed on the leaves until his rays shall have exhausted it all. The valuable parts of most manures, readily assume the gaseous form—every deep stirring, to a certain extent, in *hot* weather, therefore, impoverishes the soil. Deep ploughing, at *proper* seasons, is, I conceive, the basis of all good farming; such crops as shall enable the husbandman to extirpate weeds, and obtain large supplies of fodder, without much exhaustion, should be the great objects for his aim. I would propose that a foul sward receive its proper quantity of quick lime, which should be spread, and ploughed under, in its *caustic* state, in the early part of September; that the field be harrowed sufficiently; sown with rye at the rate of two bushels per acre, as early as possible—that it be depastured late in the autumn, and early in the spring—that in May, it be again ploughed three inches deeper than before—that it be harrowed, and left until the small weeds begin to appear—early in June, Millet should be sown—in August, the crop can be removed after the labours of the general harvest. The field should be slightly stirred with the scarifier, occasionally harrowed, and left throughout September, for the destruction of weeds as before. In Oc-

tober it may be manured, and sown with wheat, or left for a crop of Indian Corn. I am, &c. yours,

JOHN HARE POWELL.

JONATHAN ROBERTS, Esq.
President of Penn. Agricultural Society.

To the President of the Pennsylvania Agricultural Society.

I recommended, in the early part of the last year, the cultivation of Millet for fodder, and stated the success I had met, in its use as a food for neat cattle. I have since cultivated it much more extensively, and have been confirmed in the impressions I had conveyed, as to its management—its product—and its value, when applied to the support of horses, and black cattle, although I am satisfied, that it is not so well fitted for the use of sheep, as clover hay. The unusual drought of May and June, materially affected the growth of early sown Millet—the heavy rains in July and August injured as much in many cases, the quality of its fodder. I sowed ten acres of land in *good tilth*, with Millet, red clover, and orchard grass seeds: they were all lightly harrowed, and carefully rolled. As the success of the grass was more important, than the weight of the Millet crop, I sowed but two pecks of Millet seeds per acre, half the quantity which I am accustomed to use, where I desire a heavy crop of fodder. In despite of the injuries caused by the want of snow, during the winter, I have never had before so fair a prospect of thickly set sward. I should not adopt this practice generally since Millet must be sown so late, as to expose tender grasses, to the evils of drought in July and August, before they can be sufficiently strong to survive them.

Millet should never be grown upon land which is not *in good condition* and *very fine tilth*. The seeds should be lightly covered by a harrow with wooden teeth, and after

rolled. Of thirty acres upon which my last crop was grown, I tried various experiments. The field which was the most lightly harrowed was the most productive. I am led to believe however necessary the harrow is in all cases, to properly cover seeds, yet in few it is used with sufficient care, or in a fit shape. Excepting winter grains I know no seeds which are not I think usually too deeply buried.

JOHN HARE POWELL.

Powelton, Phil. Co. April 10, 1824.

To the authority of Mr. Powell we may add that of the Hon. Bushrod Washington, nephew of President Washington, and one of the Judges of the Supreme Court of the United States.

Mount Vernon, April 14, 1824.

"About the middle of May last I sowed about five acres of ground with Millet seed, (milium) at the rate of about a bushel of seed to the acre.* The ground was ploughed in a rough manner, and was in bad order when the seeds were sown, it had been slightly top dressed with barn manure some years past, and was still in good heart: the growth of the crop of Millet was rapid and luxuriant, insomuch that it attracted the attention of every person who visited the place. Intending to use the crop as hay, and finding the heads quite full of seed, and in some instances falling on the ground, I cut down, on the 16th of July, (with cradles to the scythes) four

* In the spring of 1823, the above lot was cultivated again in Millet, (without being manured,) and produced a fine crop: in October it was sown with rye and clover, and at present promises a rich harvest. The second crop was nearly as good as the preceding summer, though it suffered much from the drought in May and June. Sheep are particularly fond of the Millet grass, but not more so than horses and other stock. The Millet seed, when ground and well bolted makes bread equally as good as the buck wheat meal. Soil that answers for grain or grass, is adapted to the growth of Millet. It may be sown at any time from the 25th of April till the 1st of August, at the rate of a bushel to the acre.

acres, leaving the Millet so cut to lie in a swarth for a few hours. In the afternoon of the same day, it was carefully turned over, and the next morning, after the dew was off, it was bound in sheaves, and in the course of the same day, it was hauled to the barn loft and put away. During the whole of this process, the weather was as fine as could be desired. The remaining acre, which was intended for seed, was cradled on the 23d of July, and left in swarth till the next day without turning it, when it was bound in sheaves, and set up in small open shocks, with the heads to the sun, till about 3 P. M. of that day, when it was hauled to the barn and packed away. The whole crop was cured of a fine green colour, and although the stalk appeared in the field to be strong and stiff, it became in a few days after it was housed, nearly as flexible as clover, or timothy.

I weighed the sheaves taken indifferently from some of the wagon loads, and in this way satisfied myself that the product of each acre was about 3500 lbs. Having entertained (from what I had read on the subject) very sanguine expectations of the product of this piece of ground, I expressed to my foreman my disappointment at this result. His observation was, that he presumed that those who had gathered larger crops had probably mowed them, whereas the stubble left on the ground, in consequence of the cradle having been used, would have added twenty or twenty-five per cent to the quantity. I then went over the field and found the stubble to be about half leg high, and in many places much taller; but the protection which it afforded to the ground, and the benefit which I presumed it would derive from being turned in for the reception of small grain, determined me in future to pursue the same mode of cutting, believing that the sacrifice of part of the hay would be more than compensated by the improvement on the land and the increased product of the succeeding crop of grain. Another advantage in cradling seems to be, that the hay, by being spread, can be more

easily removed and put away than if it were mowed and treated as timothy or clover.

The Millet cut from the last acre, on the 23d of July, was carefully threshed in the autumn, and, to my great disappointment, produced only fifteen bushels of clear good seed; but, I then discovered from the quantity of chaff and light grains thrown away by the fan, that I had cut it much too early for seed. Had it remained on the ground until the seed were ripe, I think it highly probable that the quantity would have doubled, or nearly so. The Millet was generally from six to seven feet high through the lot, and the heads from five to six inches long, and well filled. Judge Peters says that he has raised a very fine crop of wheat on the millet stubble, when, in the same year, his crop was indifferent in the oat stubble, under the same circumstances.

On the 5th of May, five bushels of Millet seed were sown on four acres; on the 5th of July, the crop was hauled, and estimated at four tons per acre! I have obtained this season, forty tons from sixteen acres of which four only had been manured; the remainder could not have borne a good wheat crop. I have generally used a large quantity of seed, as not more than two thirds of those which are generally sown vegetate. Whilst my oxen consumed Millet in its green state, they performed their work with more spirit and vigour than they had done before, or have shewn since, except when fed with grain. My cattle of all ages prefer it to both red and white clover meadow hay. All kinds of birds are very fond of it, and not more so than the different species of poultry—an invaluable food for fattening them. The seeds in the upper parts of the stalks, generally ripen first; I therefore cut it when the upper parts of most of the heads contains seeds which are hard. All my observations have confirmed me in the belief, that, in this stage, it affords fodder more nutritious, and more easily made than any sort of hay. I would recommend Millet, not merely for its value as food,

b t for the means it affords of making clean the land, without summer fallows or drill crops. Deep ploughing at proper seasons, is, I conceive, the basis of all good farming. Such crops as shall enable the husbandman to extirpate weeds, and obtain large supplies of fodder, without much exhaustion, should be the great objects of his aim. When Millet is cut down with cradles to the scythes, a considerable quantity of vegetation is left on the ground; and the general opinion is, that it is sufficient to prevent any exhaustion of the land; such has been the result of experiments by the most judicious farmers.—*New-England Farmer.*

In an article from the American Watchman, recommending the growth of Millet, the following is given as the product of one acre sowed with half a bushel of that seed. Three tons of hay and 30 1-2 bushels of clean seed. The hay was consumed by horses, who seemed to relish it as they would the best upland. The seed when manufactured into flour makes a cake more wholesome and equally palatable with that of buckwheat. The writer says if *one* bushel were sowed to the acre the crops would in all probability be proportionably better.—*Ibid.*

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We have thus given not all, nor perhaps one half of what might be selected as to the culture of Millet in the United States, and the success which has been *supposed* to attend it. We give no opinion on the subject *as editors*—we simply remark, that it is a fast growing plant—furnishes a great abundance of food for animals—that it is eaten by them with great readiness and even avidity—this we personally know. It is *said* to be as good a *nurse* for *grasses*, when lands are laid down as any of the grains. This we *do not* know from personal experience. But on the whole, we think it worthy of fair, extensive, and continued experiment. If it in any respect proves unworthy of permanent favour, our intelligent farmers will find it out—but if it should prove as valuable as Judge Washing-

ton and Col. Powell believe it to be, it will be a great gain to the Country, and we shall have ill performed our duty as journalists had we neglected to take this notice of it.

SOME FURTHER NOTICE OF SOME OF THE VALUABLE VARIETIES OF NEW PEARS SENT LAST YEAR BY MR. KNIGHT TO MR. LOWELL.

We would commence by saying, that all the original trees are alive, and in good order, except the Hardenpont de Printems, (by the French Gardeners called, Beurré Rance)—There are also living about eighty grafts from them, and a great number of buds. Mr. Lowell will cheerfully furnish buds of all the varieties, as soon as they are fit, during the present season. It must occur to every one that as the trees are small he cannot answer all the demands of the public, but regardless of the speedy growth of the trees, he will give all that can be spared without injury to them.

Of the Beurre Rance, or Hardenpont de Printems there are many grafts growing in the gardens of several gentlemen in the vicinity, for the grafts from the trees survived though the parent stock died, a case not uncommon.

Of No. V. in the catalogue of Mr. Knight's pears as printed in the Massachusetts Agricultural Repository of June 1823, the following description is given in the Transactions of the London Horticultural Society accompanied with a beautiful coloured plate of the Pear, exhibiting its form and natural size and colours.—See part IV. Vol. 4 of these Transactions.

Extract from the Journals of the London Society.

"Specimens of the Marie Louise Pear were received from Roger Wilbraham, Esquire, the produce of a tree in his garden at Twickenham, trained to a south wall which is however much shaded with trees. This pear which has already been noticed in the Society's Transactions, Vol. II. page 406

and Vol. III. page 120, has far exceeded any expectations which had been formed of it. Its general form is like that of St. Germain, but tapering less towards the stalk. The skin is of a greenish yellow, deepening where exposed to the sun, or when full ripe to a rich yellow, clouded with light brown russet—flesh inclining to yellow—perfectly melting, with abundance of sweet juice. The annexed figure will convey a very perfect idea of this excellent and beautiful pear. In favourable situations however, it attains to a much larger size, being sometimes five inches long, and three inches wide and weighing eight ounces. Its period of maturity is from the middle of October to the middle of November. Those received from Mr. Wilbraham having ripened one year, 17th of October, and some which were received from Mr. Knight, not till the 15th of November, but these last were produced in the climate of Dounton [Mr. Knight's seat in Shropshire in the Northern part of Wales] which is very inferior to that of Middlesex (near London.) This is one of the numerous seedlings which have been raised within a few years in the Netherlands. The first specimens came from Dr. Van Mons when he resided at Brussels—and grafts and plants were obtained from his garden there, and subsequently from the Count Coloma at Mecklin. It is said to have been raised by the Abbé Duquesne, together with the Napoleon Pear already described in the Transactions, page 215 of this volume."

Thus it will be perceived, that in this fruit we have obtained a most valuable addition to our innocent luxuries.

We shall now add the short account given in the same Transactions of the *Napoleon Pear*, and perhaps the name will give it some interest and popularity with some persons. It may make it, if it shall prove a good fruit, a little more marketable, and therefore more profitable to our friends, who raise fruit for sale.

"Roger Wilbraham, Esq. sent a fine specimen of the Napoleon Pear, the produce of a graft received by the Society

from Dr. Van Mons of Brussels. The form is pyramidal, but irregular, something like the Colmar. The skin is green, becoming pale yellow when fully ripe—flesh white, a little inclined to pale dull yellow, of pleasant consistence, melting and juicy, of *excellent* flavour, and much sweetness. The core is small, almost free from grit, and the seeds which are small are inserted near the head. This Pear is interesting as being the first of the new Flemish varieties produced in this country with an authenticated name. [We presume this does not apply to the circumstance of its bearing the name of the most extraordinary man of the age, but that it was the first of the new varieties which was received from an authentic source.] So *much confusion* existed in the manner in which both the specimens and grafts were sent over by Dr. Van Mons that it will be a work of considerable attention to affix the original names to the produce of the trees now abundant in the gardens of the members of this Society, who have attended to the growth of *these valuable* fruits, which the *industry of the Flemish gardeners* have recently acquired."

It will be seen by this extract, that the *Napoleon* Pear is also excellent. They have omitted in this account, the season of its ripening, but Mr. Knight in his letter to Mr. Lowell published last year, states it to be November, and December, which much enhances its value.

When we consider the high state of Horticulture in England and the just pride in it—and the natural jealousy they would feel in having their near neighbours across the channel surpass them in producing new and excellent fruits, we have abundant reason to believe that those new Flemish varieties raised from seed are highly valuable.

The concluding remark in the notice of this pear as to the *confusion* of *names* of *different fruits* induces us *once more* to beg cultivators to be more attentive to this subject, and to strive as far as possible to give the correct names, the *authorized, admitted* names to every fruit tree they possess. It is

a matter of far greater moment than gentlemen are aware of. One man finds he has a fine fruit. He calls it a Virgouleuse, when in truth it is a Colmar. He recommends it to his friend as a Virgouleuse. His friend not having *that* pear, takes grafts from it, and waits five years for its fruit, when to his great mortification, and severe and irreparable loss, he finds it to be nothing but a fruit of which he had *too much* before, under the true and correct name of Colmar. Disappointed and vexed, he has no resource, but to graft the tree anew, and perhaps a second excellent and obliging friend has unwittingly deceived him a second time. It is a very serious evil in Horticulture, and demands the most strict attention. We shall never make the advances we might make in this branch while we are so careless about names. It is not indeed difficult, even for unlearned persons, to ascertain *the facts*. Let them never graft, till they have seen *the fruit*, and submitted it to those who are judges; or, at least, let them not take their scions, except from well informed cultivators.

Seckle Pear.

It may be interesting to some of our readers to know what the best cultivators in Europe think of the best, if not the only superior new pear produced in America. It is admitted, we believe, by the French and English gardeners that the Seckle Pear is *new* to them. We know that General Moreau pronounced it to be new to the French. They consider it an American production. That we have had no more new varieties is undoubtedly owing to our inattention to the subject. Even this justly celebrated Pear was the produce not of care but of accident. We have been informed that Mr. Johonnot, of Salem, has attempted with laudable industry and enterprize, to raise new varieties of the Pear from the seed; and that he has succeeded in producing one excellent variety. Cultivators ought not to be discou-

raged because so few are found to reward their labour. Dr. Van Mons of Brussels raised *eight hundred* new varieties, of which only 30 were deemed worthy of cultivation. But the labour is by no means lost; the stocks are highly valuable, and may be grafted with better fruits. In this vicinity, we have learned that fruit trees are the most valuable products of the soil, and we know instances where an acre filled with good trees in a bearing state would sell, and has been sold, for 500 dollars, when the same land stripped of the trees, would not sell for 150 dollars.

Transactions of the London Horticultural Society.

"John Braddish, Esq. sent specimens of the Seckle Pear, the produce of Espalier trees in his garden. The fruit has been already described in the Transactions of the Society from a drawing made in America and received from Mr. Coxe of New Jersey. It is gratifying to find that the present specimens, *though larger*, closely resemble the figure published with the account, and fully justify the *high character* given of the Pear by Dr. Hosack (of New York) in the paper alluded to. In shape it resembles the Swan's egg, but is a little longer. Skin of a greenish olive colour, often with much dull or bronzed red on the side exposed to the sun—flesh yellow, very fine in texture, melting, juicy and sweet, with a delicate and very *powerful bergamot perfume.* It is in this *perfume* that the *Seckle* Pear *differs from all others*, and which has caused it to be so highly extolled in America.

"The Society having received by the kindness of Dr. Hosack, a number of plants of the Seckle pear in 1819, distributed them to the nurserymen around London. It is therefore expected that young plants for sale are by this time plenty."

So far, say the English horticulturists. *We add*, that it is by such interchanges of blessings peculiar to each country,

that the enjoyments of all are increased, and we know of nothing more delightful than such an intercourse. It atones in some small degree for the evils which the ambition and ill passions of men inflict on each other. We take this occasion to say to our country friends who have not been familiar with this excellent American pear, that it is worthy of their attention. It is hardy—a great bearer—ripens at a time when they are destitute of fruit. It bears very young—very constantly; and would, if no other fruit could be obtained, of itself furnish a delightful dessert. Nothing can surpass its exquisite flavour. The writer of this article will be happy to furnish grafts in the month of March, or buds in July, to any agricultural gentlemen, if they will send to his place in Roxbury.

We shall take some notice of another new pear, because it has been introduced by one of the Trustees of this Society, and a most distinguished cultivator of fruits, S. G. Perkins, Esq. It was received from the Garden of the London Horticultural Society.

"*The Charles d'Autriche Pear.*"

It was probably so named from the celebrated Archduke of Austria, who was the most successful combatant of Napoleon, before Wellington arose to eclipse him, or at least to diminish his lustre.

"This is a large variety three inches and an half long and three inches wide. It is one of the *new* varieties sent by Dr. Van Mons. Skin greenish yellow, profusely sprinkled with brown spots and partially russetted. Flesh melting, white, very juicy, with a rich high flavour, but with little if any perfume—a *beautiful* and *fine* fruit. Ripens about the middle of November."

We hope we shall be pardoned for devoting so much of our Journal to fine fruits.

A GEOLOGICAL AND AGRICULTURAL SURVEY OF RENSSELAER COUNTY, STATE OF NEW-YORK. [BY AMOS EATON.]

[From Memoirs of the Board of Agriculture of the State of N. York.]

[We are induced to insert the Geological Survey of Rensselaer County in the state of New-York, to exhibit some idea of what we propose should be attempted for every county in this state. (See article first in this number on the importance and practicability of Agricultural Surveys of our several Counties.) We hope there are talents and zeal enough to furnish such statements. We give no opinion as to the merits of the execution. It is out of our sphere to be critics of Agricultural works. We hope that the interest which should be felt in the subject will excuse our devoting such a portion of our work to this Survey.]

To the Honourable STEPHEN VAN RENSSELAER, *Esq.*

IN taking a Geological and Agricultural Survey of Rensselaer County, I have pursued the method adopted in the County of Albany last year by Dr. T. Romeyn Beck and myself, in most cases. My enquiries in relation to the *Methods of Culture*, have, in this county, been more particular than those made by us in Albany County. In this department I have endeavoured to meet your views, by collecting materials for a kind of Agricultural Calendar, to direct the young and inexperienced farmer in regard to times of sowing, planting, harvesting, &c. as well as the most approved methods for preparing his ground. Theoretical treatises on agriculture are found in abundance on every bookseller's shelves; many of which are rather calculated to perplex, than to instruct, the practical agriculturist. I have endeavoured to carry your instructions into full effect, by rejecting all theory, and by preparing a concise system founded wholly on the experience of the labouring farmers of Rensselaer County.

Though I did not converse with every farmer in the county, I called on one, at least, in every neighbourhood in all

the towns; and I wrote down, in his presence, the methods of culture adopted by himself, and by his neighbours as far as had come to his knowledge. By this method I believe I have collected, and brought within a small compass, most of the *practical* agricultural knowledge of the county, which it will be advisable to publish.

I did not confine myself to crops of grain and grass; but I extended my enquiries to the subject of orchards, kitchen gardens, shrubbery, cattle, horses, sheep, swine, &c.

In my arrangement of materials, I follow the Albany County method, excepting the article, Method of Culture. This article I have separated from that which is strictly geological; and have been very particular to divest this part of the report of technical obscurities. As you intend this exclusively for the benefit of the labouring farmer, I have rendered it in the style of the farmers, from whom I received it.

With the ardent hope that my efforts may not have fallen short of your expectations, and that the following report may be useful to those for whom it was intended,

I subscribe myself,

Your grateful humble Servant,

AMOS EATON.

Troy, Dec. 17th, 1821.

GEOLOGY

OF THE COUNTY OF RENSSELAER.

This county, and the county of Washington on the north, and of Columbia, on the south, are chiefly of the transition formation; and this county in particular, has heretofore been considered as *wholly transition*. But I found a small tract of secondary formation in the town of Schaghticoke, about four miles east of the Hudson; and was conducted to a similar tract by the President of the Agricultural Society of the

county, in the north part of Greenbush. This formation is decidedly the compact, or secondary lime rock, reposing on graywacke. The former tract is situated on a farm of the Hon. G. Tibbits, occupied by John Button, one mile west of the Hon. H. Knickerbacker's, on the north side of Tomhanick creek, the latter is five miles, in a southeasterly direction, from Troy. Whether the argillite, or slate rock, along the eastern margin of the county, belongs to the transition class, is not yet agreed among geologists. Bakewell, and some other respectable European authorities, would place all our argillite under the transition formation. But the celebrated Werner, Professor Silliman, Dewey, and others, would class the eastern range of argillite, which limits the county, with primitive rocks. It is certainly separated from the argillite of the west part of the county, throughout the whole extent, by a continuous north and south range of well characterized metalliferous limestone; and it agrees in character with the European specimens of shining argillite.

There are difficulties, however, attending this arrangement. Equally well characterized metalliferous, or transition limestone, is to be found on the east side of this range of supposed primitive argillite throughout its whole extent. And shining argillite is to be found, at different intervals, either alternating with, or embracing extensive beds of transition limestone, within five miles of the Hudson; where most of the argillite is decidedly transition, and embraces marine organic relics.

Under every view of the subject which I have taken, and I have devoted much time and attention to the enquiry, I am not yet inclined to follow those geologists who admit a stratum of primitive argillite in the Northern States. For although there are difficulties in the way when we rank the shining argillite with transition rocks; still greater difficulties present themselves, if we denominate it primitive, according to any definition hitherto given of that class. Excepting the

talcose glazing in the natural cleavages, there is nothing in this rock of that glimmering character which is so striking in primitive rocks. The transverse fracture of shining argillite is as earthy and destitute of lustre as any of the transition classes. This, I admit, is not a conclusive argument; but this general appearance of rocks was taken into consideration by Werner himself, when constructing his system. A semi-crystalline character, especially in the aggregated constituents, he seemed to consider as essential to all primitive rocks. Excepting talcose or soapstone rocks, I believe there is no exception. And even this kind of rock is the same in substance throughout, or nearly so, as the glazing which gives the lustre to the shining argillite.

That all adjoining strata, especially in the same class or formation, pass into, and alternate with each other at their adjoining sides, is a fact well known to every practical geologist. It is well known also, that as far as these alternations continue, the alternating rocks, however distinct at distant points, here assimilate in some of their characters. If we say that the true place for the metalliferous or transition limestone is at the west margin of the primitive granular limestone, (or Berkshire range of statuary marble,) and that it alternates several times with the transition argillite, we shall be involved in no inconsistency.* The slaty form which the transition limestone assumes, its accommodating the position of its tables to that of the argillite, will then no longer appear as an anomalous formation. Anomalies are odious in any science; and their admission in any department of the science of nature, is a most emphatical admission of our ignorance.

There are, in the county, several fields and small patches of the true *old red sand stone* of Werner, resting on graywacke.

* A different arrangement was adopted in the Index to the Geology of the Northern States; which I think ought to be so corrected as to bring the granular and metalliferous limestone together.

One considerable field of it is situated in Nassau, on the west face of a hill, half a mile south of Dr. W. C. Elmore's store. Several patches of it are to be seen in Grafton and Sandlake.

This rock is similar to the red sandstone of Catskill mountains and their extensive spurs. It is not brittle or friable like the breccia* of Connecticut river. And though marine relics, especially corallines, are frequently found in it; dry land organic remains, such as those found in the breccia of East Windsor, in Connecticut, and of Nyac, in New-Jersey,† are never found in it.

A more extended discussion of these subjects would be inconsistent with the object of this survey. I will therefore say in short, that I consider the county of Rensselaer wholly of the transition formation, with the exception of the very limited localities of secondary limestone, or compact limestone in Schaghticoke and the north end of Greenbush, before described. And that all the regular strata of the county should be classified in the following order: Metalliferous limestone, Argillite, Graywacke, Red sand-stone—the last of which has almost disappeared.

There are in the county three principal ranges of rocks extending in a northerly and southerly direction. First, the rock forming the basis of Williamstown mountain, along the east bounds of this county, consisting wholly of argillite. Second, the rock forming the basis of Little Hosick valley, extending the whole length of the county. At the south part of the county it approaches very near to the east boundary; diverging from it northerly, it becomes about four miles distant. The basis rock is one continuous range of metalliferous limestone. Third, the basis rock of what is called Petersburgh mountain. This range extends from the south bounds

* The name breccia, or brittle, was applied to that rock by Werner, because brittleness or friability is its most distinctive characteristic—particularly distinguishing it from the red sandstone.

† See Ackerley's Geology of Hudson, p. 35.

of the county, to within about five miles of the north. Its most elevated part is near the middle of the county ; and it subsides into moderate hills both to the north and south. Its eastern side is abrupt and often precipitous ; its western side slopes off more gradually to the margin of the Hudson. The basis rock, thoughout this extensive range, is graywacke, reposing on argillite. The rock in view on the highest parts is the coarsest rubblestone variety ; on the less elevated parts, slaty graywacke ; and on the lowest parts the argillite appears. Consequently along the western side of the Little Hosick valley, and along the banks of the Hudson, argillite is the principal rock in view.

TRANSITION FORMATION.

METALLIFEROUS LIMESTONE.

The metalliferous limestone is intermediate in its external characteristics between the granular (from which statuary marble is taken) and the compact. It is somewhat difficult to give a definition of this rock, which shall be sufficient to distinguish it from the granular, in the state of hand specimens. It is often made up of glimmering grains like the granular ; but the grains are more indistinct, and a fresh fracture presents a more earthy appearance. It is also more variegated in its colours, and often slaty. When examined in the large rock it may perhaps always be distinguished from the granular by the veins of calcarious spar with which it is traversed. I have never discovered such veins in lime rocks unequivocally primitive.

This rock abounds in valuable ores in some countries. In South America the richest silver mines are found in this rock. But no important mines have been found in it in North America ; unless the lead mines beyond the Mississippi may be supposed to have been originally imbedded in it.

In coming from the primitive Green-mountain range west-

erly, we first fall in with the metalliferous limestone at the westernmost side of the granular. It runs along, forming the basis of a valley, mostly a little to the east of the east bounds of this county, throughout its whole extent. A range of argillite is then interposed, on which runs the east line of the county, forming a high ridge or mountain, two or three miles in width. Then the metalliferous limestone occurs again, forming the basis rock of a north and south valley, extending the whole length of the county, as before described. On the west side of the valley it passes beneath the argillite.

It seems to alternate with the argillite several times more between the valley of the Little Hosick and the Hudson; but as I could never succeed in tracing these alternations to any considerable extent, perhaps it may be more proper to denominate them extensive beds.*

SUBORDINATE ROCKS.

Transition granular quartz, or *Transition sandstone*.—These names are not authorized by any adequate authority. I use them here from the necessity of the case. If the rock I intend is known by any other name, I will cheerfully relinquish these, and substitute such older name. It differs from the primitive granular quartz by the more hyaline or glassy appearance of the grains. It seems to be to the metalliferous limestone what the primitive granular quartz is to the granular. It is not so abundant, but it is almost as constant an attendant on the metalliferous limestone as the granular

* The distinction between *beds* and *alternating layers*, is often over-looked. For example, the serpentine in the Milford marble quarries is in beds; because it is interposed between the layers of limestone, and is of limited extent compared with the limestone, being terminated by the approximation and final contact with the layers. Whereas the granite embraced in the gneiss at Chesterfield, Mass. is never in beds. It appears either in veins traversing gneiss; or it is in layers alternating with it, which appear to be co-extensive with the layers of gneiss. At least we are unable to shew in any case, that the one extends beyond the limits of the other.

quartz is on the granular limestone, from Whitehall on Lake Champlain, to Barnagat on the Hudson. In both cases the grains of quartz and limestone often become intimately blended; and sometimes in such proportions, that it is difficult to draw the line of distinction.

It is a remarkable fact, that carbonate of lime, in all its geological positions, is accompanied by silicious formations. Primitive limestone is connected with primitive granular quartz—Transition limestone with transition granular quartz —Secondary limestone always abounds in hornstone, a highly silicious mineral. And on the Eastern continent, the chalk beds contain nodules of flint in abundance.

ARGILLITE.

Argillite is the proper slate rock, or the soft slate, as it is denominated by farmers. The position of the laminæ or tables, constituting this rock, has long excited the attention of curious observers. I shall not enter into any discussion relative to Bakewell's suggestion, that it may be the result of that general crystalline tendency, which pervades the mineral kingdom. But I will describe the rock, according to the facts which have fallen under my observation.

This rock is composed of slaty laminæ or tables, standing transversely to its general direction, so as to form angles between 45 and 80 degrees with the plane of the stratum. In the Northern States the laminæ lean towards the west and north-west. The best illustration of this formation to which I am able to refer, is to be seen along the west bank of the Hudson, a little north of Newburgh, in Orange county. Several oblique layers of this stratum, lying one upon another, there present themselves as before described.

In my survey of Rensselaer county, I observed, that the laminæ became more nearly horizontal as I approached the primitive range of New-England. When this fact first presented itself, its accordance with a very flattering theory was so striking, that I did not trust to one course of observations.

I crossed the county in three nearly parallel lines, not less than six miles distant from each other in any part, and witnessed the same uniform variations on all the lines. I discovered that the inclination towards the horizontal position did not depend on elevation. For though the laminæ in Williamstown mountain were more inclined towards a horizontal position, than they were farther west; the same inclination was still more increased in the valley east of the mountain.

The range of argillite forming Williamstown mountain, separates the two ranges of metalliferous limestone before described, four or five miles from each other, from near the south bounds of the county, as far north as the junction of the Hosick river with the Little Hosick. Here the two lime-rock ranges approach each other, and the mountain subsides into irregular hills and plains. The same ranges of rocks hold on their northerly course, regardless of the varying surface of the county. Here the laminæ begin to be remarkably strait, and split into excellent roofing slate. Moses Warren, Esq. has wrought two quarries of this slate with great success in the town of Hosick for several years. Other valuable quarries have been wrought still further north. We have good reason to believe that such quarries will be frequently discovered along the whole course of this range, in the county of Washington, &c. For it appears from the observations of geologists, made in various parts of the earth, that a continuous range of any rock is remarkably uniform in its character, in its enclosed minerals, &c. *when examined at nearly the same depth.* To apply this principle, we should look for good slate in all places of about the same elevation with Mr. Warren's quarries along the same range in Washington county, between the same two ranges of metalliferous limestone. We should not expect to find good quarries far to the south, because the same elevation would bring us near the base of Williamstown mountain.

After passing over the lime-rock range of the Little Hosick valley, we find a north and south range of argillite extending through the county. It passes under the graywacke generally before we arrive at the top of Petersburgh mountain, throughout the towns of Petersburgh and Berlin, and in the northern part of Stephentown. In the south and north extremities of the county it appears at different intervals all the way to the banks of the Hudson. This range affords no slate quarries that have yet been wrought near its eastern edge; but a quarry has recently been opened in the city of Troy, by Stephen Ross, Esq. which seems to promise great advantages.

Although the slate range west of Little Hosick valley may be satisfactorily traced to the Hudson, and demonstrated to be the same continuous rock; still it becomes a very distinct variety immediately on the bank of that river, which will be described as a subordinate rock.

Wherever argillite occurs in the county, it is traversed by veins of milky quartz. These veins are most abundant and largest towards the eastern part of the county. Here chlorite (a beautiful green mineral made up of minute scales) is attached to the quartz in great quantities, and often imparts its colouring matter to the quartz. The slate itself is greatly variegated in its colours. Blue, red, purple, grey, and silvery, are the most prevalent hues of the Williamstown mountain slate.

I found no ores in this stratum, excepting the sulphuret of iron. Reports have long prevailed that copper ore exists in great quantities in Williamstown mountain. These reports excited my particular attention; and I was so fortunate as to be introduced to the principal *alchymist*, who is the neighbourhood oracle on that and other mysterious subjects. I found his copper ore to be nothing more nor less than very beautiful chlorite.

SUBORDINATE ROCKS.

Glazed Slate.—This has been sufficiently described in the report of the geological survey of Albany county. The most remarkable locality is that through which the commissioners are now cutting the canal at the Old Bank Place in Troy. The glazing is as dark and shining as the most beautiful japan varnish. Sometimes it becomes a bottle-green, and even a grass-green. On blasting, the rock flies into thousands of the most beautiful jet-black lenticular forms, perfectly glazed on all sides. Their surfaces are often sprinkled over with extremely minute cubical crystals of iron pyrites of a golden lustre.

Notwithstanding the natural cleavages, the colour, texture, &c. of this rock, differ so widely from that which is now quarried by Mr. Ross, it may be traced every foot of the way, and demonstrated to be the very same continuous rock. The glazed slate occurs at intervals on the banks of the Hudson not only through the whole extent of this county, but as far north as Fort Miller, in Washington county. It gives rise to several very strongly charged Harrowgate springs.

Silicious Slate.—This rock appears in alternating layers, tables, or in beds, near the bank, and in the bed of the Hudson, throughout the county. I know of no beneficial use to which this rock has been applied.

Alum Slate.—There is a layer of this rock embraced in the bank of argillite near the mansion-house of the Hon. George Tibbits, in Troy. But it does not appear to be of great extent. About half a mile beyond the south-east corner of the county, within the town of New Lebanon, there is a remarkable locality of alum slate. The manufacture of alum might, in my opinion, be set up at that place to great profit.

GRAYWACKE.

This coarse gray rock forms the basis of more than half

the county. It is perfectly insulated, and lies upon the argillite like a huge turtle upon the beach; its back forming the middle and elevated part of the county. Although the same rock forms the basis of a large proportion of the adjoining counties on the north, south, and west, it does not extend unbroken, into either of them. It becomes thinner on all sides, and at length leaves the argillite bare on the north, west, and south. On the east side it terminates abruptly below the brow of the hill which bounds the valley of the Little Hosick on the west.

Wherever the graywacke rests immediately on the argillite, it is the slaty variety, and takes on the form and position of the argillite. A very perfect example is to be seen on the turnpike road half a mile west of Nassau village. And the two rocks often pass into each other by such imperceptible gradations, that it is difficult to fix upon the dividing point. Very good samples of this kind may be seen at the junction of the Hosick and Hudson rivers, at Waterford bridge, and along the road at and above Mr. Tibbits's. Though graywacke slate is generally of a grey colour, it is found of a sky-blue colour in many places, and sometimes brick-red. There is a limited locality of the latter colour on the line between Troy and Brunswick, on the Sandlake road.

On ascending the hills, we find the fissile slaty variety of graywacke giving place to the more compact; and its colour becoming more blue and greenish. Quarries of this variety have been wrought by Mr. D. Buel, Mr. A. Gardner, Mr. R. P. Hart, and others, in Troy, Brunswick, &c. for several years. It makes excellent building stone, when applied to places not exposed to heat. It has been sawed and so wrought as to form beautiful blocks for the basement story of some of the best houses in Troy. Farther east, in the interior of the county, as in Grafton and Sandlake, we find the beautiful green and blue varieties very abundant. But on ascending the higher hills of those towns, the only rock,

in place, which presents itself, is the coarse rubblestone variety of graywacke; which will be treated as a subordinate rock.

I found no organic relics in the graywacke of this county. In truth, I have not been informed of the discovery of any organic remains in this county, excepting the *orthocerite* in the argillite of Troy, and the *terebratulite* in the secondary limestone of Schaghticoke. Very thin and limited beds of anthracite have been found in graywacke in various places in the vicinity of the Hudson, particularly at Schuyler's quarries in Troy. Iron pyrites is frequently found in this, as in the other transition strata. It is said that sulphuret of lead has been found in it in this county also; but the fact seems not to have been well authenticated. I was shewn some of the lead ore, and found it to be attached to pieces of graywacke rock; but from the best evidence I could procure, it seemed probable that it was brought from Columbia county.

SUBORDINATE ROCKS.

Rubblestone.—This rock has formed a subject of some discussion. It puts on so many appearances that it has been a source of much confusion, when studied in the state of hand specimens. It has also afforded opportunity for closet speculators and some of our ephemeral reviewers, to display a degree of ignorance equalled only by their impudence.

There are numerous localities in the towns of Grafton and Sandlake, where this rock, in a single continuous and unbroken field, presents the green graywacke, the coarse granulated variety, the porphyritic variety which is speckled with felspar, and that variety which has the appearance of puddingstone. I examined vast rocks of the compact blue and green graywacke, which embraced within their most solid parts, large masses of an aggragate in all respects resembling the common puddingstone: excepting that the cement was chiefly aluminous. In our district of country, the pudding-

stone cement is carbonate of lime of oxyd of iron; and it is always insulated, forming a genuine alluvial rock. Whereas our rubblestone variety of graywacke, like that which is so abundant near Boston, is firmly established in its connexion with other rocks.

I did not find any very good locality of *hone slate* or *grit sandstone*. But such rocks frequently occur in limited patches in various parts of the county.

ALLUVIAL FORMATION.

GEEST.

This kind of soil, being formed from the immediate disintegration of parts of the existing rocks, partakes of the nature of the argillite and graywacke in a large proportion of the county. Such is the rapidity of the dissolution of argillite, that farmers denominate the geest overlaying slate rocks, their slaty soils. Col. John Carpenter, of Hosick, has a farm, whose basis rocks are argillite and graywacke slate. Ten or twelve years ago several of his fields were chiefly made up of bare rocky knolls. Now most of these knolls have become good arable land. It has been his practice, especially since cast iron ploughshares came into use, to drive his team across these knolls when ploughing the adjoining grounds; and thus to break up at every ploughing a little of the exposed parts of the rock. In a few years these broken fragments became good soil.

Col. Carpenter found that the graywacke slate which capped his highest hills, required more time and made a more silicious soil. The soil immediately formed from it is mostly of the granulated kind; but it becomes more loamy in a few years.

Dr. N. B. Harris, of Sandlake, and Gen. M. Moffitt, of Stephentown, have observed the same process of disintegration and rapid formation of soils on their respective farms.

And almost every farmer, whose land is situated on slate hills, has observed that his soils are yearly becoming deeper and better. Even where the underlaying rock is graywacke slate of the brittle fissile variety, the same process of disintegration is observable, though its progress is less rapid.

ALLUVION.

This formation presents some of the most interesting phenomena, which are connected with the natural history of the earth. The more ancient alluvion, which was probably formed while the ocean stood over our continent, never embraces any leaves, timber, or other vegetable substances. The recent formations of alluvion always embrace numerous vegetable substances, which belong to species now found growing in the same district. That part of the city of Troy, which is situated between the river and hills, belongs to the recent formation of alluvion. Well-diggers always find at a great depth, abundance of branches, leaves, &c. of the hemlock tree, (*pinus canadensis*,) and of other trees now growing in the immediate vicinity.

The order of the layers in both the primary and secondary alluvion, seems hitherto to have eluded the science of classification. It is very probable that future observations may enable geologists to establish a system of arrangement in this department of nature. I will here contribute my mite, by giving one locality. On the rock of glazed argillite in which the canal at the Old Bank Place in Troy is cut, the alluvion presents the following layers:—1st. One foot of loam at the surface. 2d. Four feet of coarse gravel. 3d. One foot of good building sand. 4th. Three feet of clay marl, containing 15 per cent. of carbonate of lime. 5th. Coarse sand, striped horizontally with black, which rests on the rock.

We are not acquainted with any established rule for determining, from an examination of the soil, what timber trees

grew upon it originally. The trees, as well as other plants, vary greatly on the same piece of ground at different periods, under different circumstances. For example, the dense forests of evergreens, consisting of the hemlock tree, (*pinus canadensis*,) the three kinds of spruce, (*pinus, alba, nigra*, and *fraseri*,) the fir tree, (*pinus balsamea*,) on the western declivity of Catskill mountains, are succeeded by the black birch, (*betula lenta*.) and wild cherry, (*prunus virginiana*,) if the ground is neglected two or three years after the first clearing. Similar facts have been stated to me by several farmers in Rensselaer county.

Notwithstanding this variation in the natural productions of soils, some rules may be adopted in regard to this subject. 1st. Sandy alluvion invariably produces the pitch pine, (*pinus regidus*,) wherever it occurs in this county. 2d. Clay soil in low situations produces the white oak, (*quercus alba*,) and pin oak, (*quercus palustris*,) and sometimes other species of oak. 3d. Loamy soils resting immediately on the hardpan, uniformly produce the beech tree, (*fagus ferruginea*,) and the sugar maple, (*acer saccharinum*.)

From the south bounds of the county to the city of Troy, run nearly parallel to the Hudson, two ranges of alluvion. One is clay alluvion, being from one to two miles in width, and from the fourth to half a mile distant from the river. The other is sandy alluvion, being from one to two miles in width, and lying immediately adjoining the clay range. Where these two ranges meet, an excellent strip of land, being a due mixture of sand and clay, is formed, about half a mile in width. Much clay marl, yielding from ten to fifteen per cent. of carbonate of lime, is embraced in this range. The clay range approaches the river as it proceeds northerly, and forms most of the first hill back from the bank of the river. And it continues pretty uniformly throughout the county.

On the river side of these ranges the soil is mostly gravelly loam or river alluvion. In some places clay flats are

formed. On the eastern side commences the yellow loam, often very gravelly, which forms at the least three fourths of the soil of the county. In some places it contains so much clay as to be denominated *clay loam*, in other places it should be called *upland loam*.

MARL BEDS.

There is an excellent bed of marl on the land of Jacob Sharp, near the northwest corner of the town of Sandlake, six miles from Troy. I examined it in company with the President and Secretary of the agricultural society; and we judged the quantity to exceed that of any bed of the kind either of us had hitherto examined. Its depth and extent exceed any of those which we examined in Albany county, and it appears, on analysis, to be equally rich.

Mr. Thomas Cole told us, that the bottom of the pond on Aaron Vandercar's land, half a mile south of Sharp's marl bed, consisted of a bed of similar marl. This he had ascertained by sounding it with long poles. This pond might be drained without great expense; and while it would afford marl to the neighbouring farms, would itself become rich bottom land.

It is a remarkable fact, that all the marl beds in Albany county, and in Rensselaer county, are surrounded by that kind of loose gravelly soil, which is most benefitted by the application of this kind of calcarious marl: while the sandy pine plains in both counties are every where underlaid with, or in the vicinity of, inexhaustible beds or layers of clay marl, which is the best of all manures for that kind of soil.

In the town of Scaghticoke, in connexion with the secondary limestone, near the Tomhanick, before described, there is a kind of shistose marl, or rather argillaceous limestone, which serves as an excellent manure for the surrounding gravelly farms. It is readily disintegrated on exposure to air and moisture. It contains forty per cent. of carbonate of

lime, and being combined with clay, it possesses, for all agricultural purposes, the properties of very good marl.

COAL AND PEAT.

This county being almost wholly of the transition formation, we have no reason to believe that a coal bed will ever be found in it. Thin layers or beds of anthracite, or glance coal, are frequently found in the rocks of graywacke slate. I have seen those layers in Schuyler's quarry, about an inch in thickness.

Considerable money has been expended in digging for coal in Greenbush, in the glazed slate. Inexperienced persons were deceived by the black colour of the slate. Such enterprising individuals ought to know, that as iron pyrites and yellow mica are not gold,—for "all is not gold that shines;" so the black slate of Greenbush, and the shorl near Lake George, are not coal,—for all is not coal that is black.

Peat can hardly be said to have been discovered in this county. Though several swamps and boggy fens seem to contain the materials for peat to great depths. But the vegetable matter seems not yet to be sufficiently decomposed, nor to be sufficiently charged with bitumen.

ORES.

Loose masses of hematitic iron ore, similar to that of Salisbury mines, in Connecticut, are frequently found along the Little Hosick range of metalliferous limestone.

A mixed ore consisting of oxyd of manganese, oxyd of iron, carburet of iron, and, I believe, carbonate of iron, frequently occurs in various parts of the county. It appears in situations resembling bog ore formations. The principal locality is on the lands of C. R. Colden, Esq. in Pittstown. Similar formations appear in Hillsdale, Columbia county; Blenheim, Schoharie county; and in other graywacke districts.

SALTS.

In our survey of Albany county, we mentioned the efflorescence of epsom salts, on the clay banks in Coeymans. There is a similar locality three miles north of the village of Lansingburgh, on the farm of Judge Hickock. It oozes out from the clay bank of the Hudson, and becomes a very thick efflorescent crust in dry weather. In quantity it greatly exceeds that produced at Coeymans. In truth, it is formed so fast, that I believe a method might be adopted for collecting it so as to render it a source of profit.

MINERAL SPRINGS.

Sulphur springs, or waters charged with sulphuretted hydrogen, issuing from the glazed black slate, are very abundant on both banks of the Hudson, from Fort Miller to the Highlands; a distance of about one hundred and thirty miles. The Greenbush sulphur springs are well known as being more highly charged than perhaps any spring of the kind in this district. One of these springs is opposite to Albany, and the other is about three miles south, near the country seat of Mr. Genet. There is a similar spring issuing from the same range of black glazed argillite, almost as highly charged, near the Old Bank Place, at the north end of Troy. Other sulphur springs, of different degrees of strength, occur in various parts of the county.

The most remarkable springs in the county, are the nitrogen springs, in the northeast corner of the town of Hosick. They are on the farm of John Bratt, six miles southwesterly from the village of Bennington, in Vermont. There are three springs comprised within about four or five acres of ground. The quantity of pure nitrogen gas, or azotic gas, which issues in the form of bubbles from these springs, is incalculable. The gas does not seem to be combined with the water, but to issue from the gravel beds beneath the water of the springs. And we have no good reasons for say-

ing that the gas is confined to the beds of these springs. It may continually issue from the dry parts of the soil in their immediate vicinity, and become manifest only where the water covers the soil, by bubbling through it. By pressing upon a surface of the gravel, equal to five or six inches square, a quart of the gas may be collected in an inverted jar or bottle, in ten seconds.

By what process in nature is such an abundance of nitrogen gas incessantly produced? This is an enquiry which, in the present stage of human knowledge, will confound the geologist and the chemist. About three-fourths of the atmosphere is nitrogen gas; and we are acquainted with no other extensive reservoir of this substance. If it is derived from the atmosphere, how is it introduced into this situation? Or, if this process of nature should be explained, how is the oxygen of the atmosphere separated from the nitrogen?

The wells and springs near the Hudson, are, almost without exception, more or less charged with muriate of lime. The springs in the interior and more hilly part of the county, contain less of this salt; and in some of them we could not detect any of it. The nitrogen springs, or rather the springs through which the nitrogen gas issues, are very highly charged with muriate of lime.

SYNOPTICAL VIEW OF SOILS.

The Soils of Rensselaer County analyzed and classified from average Specimens, with their General Constituents subjoined.

CONSTITUENTS.	1st. GRANULATED SOIL.	2d. UPLAND LOAM.	3d. UPLAND CLAY.	4th. LOWLAND LOAM.	5th. CLAY LOAM.	6th. SANDY ALLUVION	7th. RIVER ALLUVION	8th. LOAMY ALLUVION	9th. CLAY ALLUVION
Silex, ...	70.5	65.	62.5	64.0	63.	87.5	57.0	68.0	48.0
Alumine, ...	21.5	22.75	26.0	21.0	24.5	6.	20.0	18.0	39.0
Carbonate of Lime, .	0.0	1.25	0.0	1.0	0.0	0.0	4.5	1.0	2.0
Soluble Salts, ...	0.0	1.5	2.5	1.	2.	0.0	2.0	.5	2.0
Animal and Vegetable Matter,	5.0	5.5	5.0	9.	5.5	4.	12.5	8.5	5.0
Water, ...	2.5	3.5	3.0	3.	3.0	1.5	3.	3.0	3.0
Oxyd of Iron, ...	.5	.5	1.0	1.	2.	1.	1.	1.	1.0
	100.0	100.0	100.0	100.	100.	100.	100.	100.	100.
Alumine settled	in ¾ hour.	in 4 hours	in 12 hours.	in 2 hours.	in 5 hours	in ½ hour.	in 1½ hour.	in 1½ hour.	in 26 hours.

METHODS OF CULTURE,

Or, An Agricultural Calendar for Rensselaer County.

GENERAL OBSERVATIONS.

The most general rotation method of crops, adopted in this county, where the land is warm, loamy, or sandy, containing but a small proportion of clay, and not mountainous, or very greatly elevated, is as follows :—

1st. *Winter Wheat*, sowed about the middle of September, after ploughing up sward ground in the heat of summer, either June or July, and cross ploughing twice.

2d. *Indian Corn*, planted about the middle of May, after the stubble had been twice ploughed, and furrowed the same spring.

3d. Some kind of *Spring-Sowed Crop*, as oats, barley, peas, flax, spring-wheat or spring-rye, sowed in the month of April, after the corn hills had been twice ploughed and harrowed.

4th. On the last mentioned spring-sowed crop, immediately after sowing, sow *Clover* and *Timothy Grass*. This crop is either mowed, or pastured, until three or four years from the time the seed is sown; then it is broken up, and wheat sown again as before. (W. Canfield, J. Wilson, S. R. Campbell, W. Jaques, W. Fitch, S. Hitchcock, S. Griffith, J. Phillips, R. Rogers, N. B. Harris, H. S. Vandercook, M. Warren.)

Where the land is clay-loam, or the common yellow loam, underlayed by hardpan, or land subject to be overrun with quack-grass, or noxious weeds, the most common rotation method in this county is :—

1st. *Potatoes*, or *Indian Corn*, planted about the middle of May, after the sward had been twice ploughed, (once the preceding fall, if the clay is considerable,) and furrowed.

2d. Some kind of *Spring-sowed crop*, as oats, barley, peas, or flax, sowed in April, after ploughing twice, and harrowing.

3d. *Winter Rye* or *Wheat*, sowed the first or middle of September; or *Spring Wheat*, or *Rye*, sowed in April, after twice ploughing and harrowing.

4th. On the last mentioned sowing, *clover* and *timothy*—immediately after sowing if spring grain; on a late March snow, or on a damp rainy day near the last of March or in April, if winter grain. This crop is generally mowed or pastured until four, five, or six years after the seed is sown; then it is broken up and planted as before. (H. Sarles, J. A. Fort, S. Germond, W. M'Chesney, Elder Turner, C. A. Colden, W. C. Elmore, H. Du Bois, J. Carpenter, A. Worthington.)

All the mountainous parts of the county are excellent for oats, barley, flax, potatoes, turnips, beets, and carrots. And every part of the county is very productive of either grass or clover. Therefore it is an excellent county for dairies; though but few farmers at present keep large dairies. The clayey farms are very near half a month later in the spring than the sandy or loamy farms. The loamy soils can never be ploughed too deep, nor mellowed too much; but sandy and clay soils should merely he turned over, in a flat furrow, and not afterwards ploughed so deep as to break the turf. For the clay, if mellowed too much, will become mortar in wet weather, and bake in dry. And the sand will become too loose to support vegetation. (A. Worthington, W. Van Duzen, S. Gregory, L. Finch.)

Soils which contain much clay should be ploughed in the fall, and lie in furrows through the winter, for all summer crops. (J. Wadsworth, H. Hickock.)

Stones cannot be picked off too close from sandy or loamy soils; but a considerable quantity of small stones are very useful in clay-loam, for preventing its becoming too compact. (John Stephens, Ziba Hewitt.)

The soil of the Knickerbacker estate, in Schaghticoke, may be considered as the standard of excellence. It con-

tains an average of fifteen per cent. of animal and vegetable matter, and a large proportion of carbonate of lime. *Vide Analysis.*

The rotation method which has always been adopted by this family, (they have occupied it one hundred and twenty years, and five generations have been born upon it,) has been in the following simple order. Certain fields have been alternately devoted to wheat and peas. Those fields are sowed to peas in April. Immediately after the peas are harvested, it is ploughed three times, and sowed, from the 10th to the 20th of September, to wheat. After the wheat harvest it is pastured until winter; but no grass or clover seed is ever sown upon it, as these grow up spontaneously in great abundance. Sometimes oats and flax are substituted for peas. Thus a crop is harvested on each wheat field every year,—one year wheat, the other, peas, oats, or flax. Though no manure is ever applied to this land, it has yielded from twenty-five to thirty bushels of wheat per acre every other year, for ages past.

Certain other fields are devoted to Indian corn, potatoes, &c. In the culture of these there has been nearly the same uniformity. 1st. Corn and potatoes. 2d. Spring-sown grain. 3d. Wheat. Thus corn returns every fourth year.

The whole of Schaghticoke flatts, consisting of almost two thousand acres, is very similar in quality, and cultivated in a similar manner. It is wholly river alluvion, in which the Hosick and the Tomhanick unite their waters.

With regard to the general application of manures, it is the opinion of every farmer with whom I conversed, that yard manure, and ashes, are most useful on land which contains a considerable proportion of clay; and that plaster has but little effect on clay soil. But that muck manure* and

* This is a name which our farmers give to that decomposed vegetable matter intermixed with earth which settles down into slough holes, swamps, &c.

plaster (gypsum) are the most profitable and economical manures for gravelly, loamy, and sandy land. The muck manure ought to be carted on the field in the dry part of summer, and remain in small heaps during winter, as much exposed to frost as possible. And it will not produce so much effect the first year, as it will in any of the ten ensuing years. (C. Porter, J. Brockway.) Plaster is most profitable if applied in the hottest part of the summer, particularly when sown on a clover field. (W. Canfield, J. Brockway.)

Loose sandy or gravelly soil is not benefitted by yard manure after about three years; whereas clay or clay-loam will retain it eight or ten years. Any kind of clay or even hardpan strewed upon sandy or gravelly soil, will give it consistency and prepare it for retaining manure. (Wm. Fitch, C. I. Schermerhorn, J. Hitchcock.)

Plaster produces the best effect the first year; but if a bushel or two per acre be sown on old sward ground in the heat of summer, it prepares the land for bearing a rich crop of winter wheat, or of any summer crop the next season. (W. Fitch.)

Well rotted manures should be placed under shelter a year or two for kitchen gardens. The trouble and expense of this process will be richly paid. (Dr. Hammond.)

The mountain meadows of Grafton, Berlin, Sandlake, &c. are frequently overrun with what farmers call mountain polypod, (*Dicksonia pilosiuscula*,) after they have been mowed six or eight years. Such meadows should be ploughed in June, and sowed to buckwheat, a bushel per acre, the first week in July. About ten quarts of clover and timothy seed should be sowed at the same time, and a bushel of plaster. The same process is very useful in clearing land from moss, lichens, and Canada thistles. (Dr. Hammond, A. Worthington.)

AGRICULTURAL CALENDAR.

SPRING WHEAT.

This crop is so frequently choaked with grass and weeds, that it ought to be sowed on land which had been hoed the preceding year. Of course it should follow potatoes or corn. The land should be twice ploughed, as early as the frost will permit a plough to enter the soil. And if the land be clay-loam or clay, it should be ploughed once the preceding fall. It should be sowed, a bushel and a half per acre, the last week in March or first week in April. (M. Younghans, H. Platt, A. Worthington, J. Turner.)

The cultivation of spring wheat ought not to be encouraged, as it tends to increase the wheat insect, or Hessian fly, in the country. (W. Canfield, J. Phillips.) But if the wheat be soaked twelve hours in strong brine, insects will not injure the crop. (H. Knickerbacker.)

SPRING RYE.

The same method of culture before mentioned for spring wheat, is applied to spring rye. But I was not informed of any objection to rye on account of insects. It should be sowed quite as early as spring wheat; or if either be sowed first, it should be the rye.

OATS.

The next crop to be sworn after spring wheat and rye, should be oats. The land should be twice well ploughed and harrowed, and the seed should be sowed about the middle of April. It grows best on hills or even mountains, where the soil is loam underlayed by hardpan. It seems to be, in truth, the very grain designed to furnish bread for the inhabitants of mountainous districts. (S. M'Chesney, H. Sarles, J. Stephens, Z. Hewitt, Younghans.)

FLAX.

Flax seed should be sowed about the 20th of April. It

grows best on land that is considerably elevated—even the hardpan mountains, thinly covered with the yellow loam, yield excellent crops of flax. (Z. Hewitt, H. Sarles, S. M'Chesney, Dr. Hammond.) Twenty-eight quarts of seed per acre is better than more. (J. Carpenter, S. Baker.)

It seems to be admitted by every farmer in the county, that ashes is the best manure for flax. The seed should be soaked about half an hour in weak lye; or rather in strong lye diluted with six times as much water. If it is taken wet from the lye and rolled in plaster, it is better. Let it be sowed on land well ploughed twice and harrowed, which had been planted with potatoes or corn (potatoes preferable) the preceding year. Just as the flax is coming up, sow on it two or three bushels of strong ashes per acre. (W. Canfield, E. Cady, W. Fitch, E. Boyce, J. Potts, J. Turner, A. Worthington, N. B. Harris.)

J. Turner raised on the mountainous tract at the northeast corner of Nassau, by a process similar to the above in all material respects, 382 lbs. of flax from 35 quarts of seed.

Flax is better if pulled a little before the seed is ripe. The seed will ripen in the swath, if it is plump and full-grown before the flax is pulled. (J. Turner.)

BARLEY.

It should be sowed the last week in April, on land prepared as for oats. It grows best on hills and mountains, like oats. The yellow loam underlayed with hardpan on the mountains of Sandlake, Grafton, Berlin, &c. produces great crops wherever barley is sowed. But it is not cultivated there as much as it ought to be. (H. Sarles, Z. Hewitt.)

Soaking seed half an hour in weak lye, is said by several farmers to be useful. All agree that it ought not to be harvested until the straw is entirely dry.

PEAS.

Most farmers in the county sow peas the last week in

April or first week in May—about two bushels and a peck per acre. (M. Younghans, W. Van Dusen.) But Col. A. Worthington sows his crop the 10th of June. All complain of bugs in peas; and it has become such an evil that many farmers have entirely discontinued this crop on that account. Col. W. says he has sowed his peas on the 10th of June six years in succession, and that a bug has never been seen in his peas. Whereas his neighbours who have not adopted this practice, have scarcely a pea without a bug in it. He supposes the season for depositing the egg for the pea bug is passed before his peas are in flower.

Peas the best of all crops to precede wheat. (C. R. Colden.) Peas ground with corn, make the best of feed for fattening hogs. (S. Germond, J. Knickerbacker.)

POTATOES.

Potatoes should be planted the first ten days in May, or a little before planting Indian corn. But it is better to postpone the planting of potatoes than of corn. Therefore in the hurry of spring work, farmers often leave their potatoes to be planted the last week in May. To plant them earlier will never injure the crop in any season; and if the season happens to be very dry about harvest time, the crop will be much better if planted the first of May. (J. Bratt, H. Moffit, C. D. Colden, J. Knickerbacker, B. Mather, M. Younghans, J. Carpenter, J. Masters.)

Potatoes always a sure crop in the yellow loam of the mountainous parts of the county. (H. Sarles, S. M'Chesney, Z. Hewitt.) Elder Turner, of Nassau, whose farm is one of the most mountainous in the county, plants potatoes the fore part of May on sward land, and rarely has less than four or five hundred bushels from an acre. On all soils potatoes should be planted on sward land about the first of May, if convenient. (A. Bush.)

Seed potatoes should never be cut—one large whole pota-

toe is sufficient for a hill. The outside skin of a potatoe, called the cuticle, is the most durable part, and retains the moisture for the use of the young plant, until it is all exhausted. If potatoes are cut, the nutritive juice is absorbed in a great measure by the earth. The evil of cutting seed potatoes is more manifest on a dry soil than if moist. It is a mistaken opinion that a whole potatoe is not so good on account of bringing the plants too near together; for the roots, which yield all we seek for, spread in all directions, and fill the hill. (Elder Turner.)

Potatoes, if planted in sandy or loamy soil, will yield one third more if a table spoonful of plaster be thrown upon the naked potatoes in each hill, after they are dropped, and before they are covered. (W. Fitch, H. Platt, W. Canfield, N. B. Harris.)

Yard manure is very useful, if laid over the potatoes in each hill, after an inch of soil has been laid upon them; and then the hill covered as deep as usual. But if the manure is laid directly upon the naked seed, or under it, a drought will injure the crop. (A. Mather.)

The most convenient method for raising potatoes is to plant them about the margins of cornfields. Then a horse may turn upon them when ploughing among the corn, without injury. (W. C. Elmore, A. Worthington.)

Potatoes should be hoed when first up, just to clear out the weeds, without making any hill. After they grow up about six or seven inches, they should be hilled up for the last time. If weeds spring up among them, they should be pulled out, not hoed out. For if hoed again, many new potatoes will set, which will never grow large enough for use, but will check the growth of those early set. (Elder Turner, M. Warren, G. R. Davis, U. Gregory.)

INDIAN CORN.

A large majority of the farmers of Rensselaer county, pre-

fer the middle of May for the planting season; and prefer twice ploughing and furrowing. But if the land is very dry and warm, the corn should be planted the first week in May, to prevent suffering by drought. (J. Knickerbacker.)

Corn is generally best on all soils, if planted on sward land, which had been sowed to plaster, a bushel per acre, in the hottest part of the preceding summer. But it is generally the best economy to let one crop of wheat precede it, if the land will bear wheat. When corn is raised on clay loam, it ought always to follow sward; and should be once ploughed the preceding fall. (Elder Turner, S. Howard, J. Masters.) Ashes, or lime, ought always to be applied to the top of corn-hills immediately after planting, if it follows sward, to prevent grub larva from destroying it. (J. Masters, I. Phillips.)

Clay soil, (not clay loam,) and sandy land should have the turf turned over very flat, and be lightly harrowed lengthwise of the furrows; and then be furrowed by the mere scratch of a light plough. (H. Dubois, J. Phillips, C. I. Schermerhorn.)

Most farmers in the county wet the seed corn, and roll it in plaster; and when the corn is hoed once, they apply a table spoonful of plaster to each hill, unless the soil contains a large proportion of clay. In that case ashes is used as a substitute.

Every farmer prefers stirring the soil about the hills of corn, at least three times during the season. But they differ considerably as to the times and methods. If the soil is sandy, or a fine loam, it may be harrowed once and ploughed twice, as a substitute for hoeing. But one should go through the field each time with a hoe, and set up all those hills which may have been disturbed by the team or plough. (W. Canfield, I. Phillips, J. Potts, E. Boyce, B. Mather.) This method is not considered as preferable in any case, excepting where a farmer has land enough, and labour is high. These regular hoeings and ploughings must, under all other circumstances, be preferable.

Some farmers top the stalks, and save the tops for fodder, leaving the part below the ears to rot in the field. The best method of harvesting corn is, to cut up the whole hill, near the root, with a sickle, about the 10th of September, and dry it in small stacks of five bundles each. Then cart it into the barn, husk off the ears, and put up the stalks for fodder. This yields a great quantity of the best of fodder for winter milch cows. (B. Mather, S. Gregory.)

Seed corn should be selected from the first that is ripe, and saved by stripping down the husks over the stems, braiding the ears together, in bunches of two or three dozen each, and hanging them up in a garret or other dry place. Corn is so apt to suffer from moisture, that no other known method seems to be sufficiently guarded. (J. Potts, E. Boyce, J. A. Fort, H. Moffit.)

BUCKWHEAT.

Few persons in the county cultivate buckwheat. They consider it rather as the proper grain to be cultivated by the indolent and slovenly. All agree, however, that it is useful in driving out the oxeyed daisy, (*crysanthemum leucanthemum ;*) butter-cup crowfoot, (*ranunculus acris ;*) Canada thistle, (*cnicus arvensis ;*) and other noxious weeds, as well as the quack-grass, or couch grass, (*triticum repens.*) It is sowed some time in July, and will grow very well on the most barren land in the county, if well plastered. But all farmers agree that it impoverishes land.

TURNIPS.

There is no difficulty in raising turnips on new land; but it is very desirable to know the best method of raising them, at least a small patch every year, on old farms. Mr. Henry Du Bois, of this county, and Maj. E. Cady, of Columbia county, say, that they have succeeded in obtaining good crops several years in succession, by the following process. Turn over a turf of old sward the first week in June. Yard

cattle at night on this, in the proportion of six head at least to a quarter of an acre, until the 20th of July. Then harrow lengthwise of the furrows, so as not to disturb or overturn them, and sow in the proportion of about half a pound of seed per acre.

If it is not convenient to yard cattle upon it sufficiently, about two inches of well rotted manure harrowed in as above will do for a substitute. Mr. C. R. Colden applies the manure by strewing it in shallow furrows two feet apart, then buries the manure by two side-furrows, and harrows the ground level lengthwise of the furrows. He sows the seed in drills over the manured furrows. This method requires less manure, and he has the advantage of hoeing the turnips in drills.

WINTER RYE.

Rye should be sowed the last week in August, or the first week in September, at the rate of about thirty-six quarts per acre, some say forty-eight quarts. (M. Younghans, S. Gregory, U. Gregory.) But if it is not sowed at that time, it ought to be delayed until late in November, so that it may not come up until spring. (H. S. Vandercook, U. Gregory, M. Warren.) A. Worthington had a good crop, which he sowed in a January snow storm.

Rye raised on upland makes much better flour than that which is raised on low or damp land. (J. Masters, M. Warren, A. Worthington.) And any rye will be much better, for harvesting while the joints of the straw are green. (J. Knickerbacker, J. A. Fort, J. Carpenter, A. Worthington, W. Canfield, S. Gregory.) But H. Platt says, he has made the trial to his entire satisfaction, and believes it will not make so much, nor so good flour, as it will if cut when fully ripe and the straw perfectly dry.

WINTER WHEAT.—CLOVER AND GRASS. KITCHEN GARDENING.—CONDIMENTS.—FRUIT TREES.—FOREST TREES AND SHRUBS.—LIVE STOCK.

[The particulars under the above several heads, omitted for want of room.]

NOTICE RESPECTING SEVERAL VEGETABLES, USED AS ESCULENTS, (OR FOOD,) IN NORTH AMERICA. IN A LETTER TO RICHARD ANTHONY SALISBURY, ESQ. F. R. S., &c. By M. JOSEPH CORREA DE SERRA, F. R. S., &c.—1821.

THIS article, which has never appeared, so far as we know, in any American work, was published in the London Horticultural Transactions. There are various and powerful reasons, why we should do ourselves honour, and render a just tribute to the enlightened author by republishing it. Mr. Correa de Serra selected this country as an asylum during the convulsions to which his native country, Portugal, was exposed. He finally enjoyed the honour of representing Portugal at the American Court, as its Minister. His various and extensive knowledge, particularly his profound acquaintance with natural history is known to every man of reading in our country. He enjoyed the friendship and confidence of most of the distinguished characters in this country, and it would not be extravagant to say, that no foreigner ever visited our shores, who possessed a mind more enlarged, or better cultivated. He devoted much of his time to the study of the plants and natural productions of the United States, and it would not be more than just praise to say that he contributed as much as any man to the encouragement of a taste for natural history, now assuming something like its due share of importance in our country. We owe it therefore to his memory to put upon our printed records this memorial of one of the most accomplished scholars, whom we have had the happiness to welcome in our country.

Although the subject is an American one, and therefore it might be supposed familiar to us, yet our country is so vast in extent, that it is probable many of the facts will be as new to a great portion of our population as they were to the Europeans.

The paper hereinafter published was read to the London

Horticultural Society, July 17, 1821. It was addressed to one of the Trustees of that Board.

"DEAR SIR,

"It is impossible to foresee the full extent of happy consequences which may result from the labours of the Horticultural Society. It is the *first attempt*, that I know of, towards a confederation of *science* and *practice* directed to raise Horticulture *above* the state of an *Empiric* art, such as it has been heretofore. Now the encreasing capital of botanical knowledge will furnish new objects, on which to try the proceedings of cultivation, and the daily progress of vegetable physiology will no doubt direct these proceedings by clearer and safer principles, extending their application to almost every plant which nature has made fit for the food of man.

"I wish this example first given by your glorious Island [it must be known, that M. Correa de Serra was not British in his feelings, but highly republican] may be followed by all other civilized nations, and propagate the taste for such enlightened pursuits, which add to the comforts and pleasures of mankind, *unaccompanied with any counterbalancing evil.* If in future I enjoy sufficient leisure, I will try to concur, myself, in an undertaking so analogous to my way of thinking and feeling.

"For the present I venture to offer you the enumeration of a few plants, not yet cultivated in Europe, which my long residence in North America suggests to my recollection. You may present it to the Society, if you think it in any wise deserving of that honour.

"1st. The young shoots of the Phytolacca decandra, (see Botanical Magazine page 931) which the Americans call 'poke' are brought in quantities to the Philadelphia market early in the season. They are eaten as a substitute for Asparagus which they resemble in taste. The plant requires no cultivation and if it were treated, as you treat the Crambe

maritima (Sea Kale) the taste of the sprouts would scarcely be distinguished from the real Asparagus.

[This information is entirely new to us, though we live only three days ride from Philadelphia. The Phytolacca decandra is very common by our road sides in the interior, though rather rare near Boston. Dr. Bigelow gives to it besides the popular name of Poke, that of "Cocum." It might easily be introduced into our grounds. Medicinal properties are ascribed to its root, but this should be no objection to its culture, as the same is true of the Rhubarb, now in so general use. It is at least well to know, that our neighbours in Pennsylvania use this plant in large quantities, as an Esculent.]

"2d. The Americans, settled on the Washita river, and in the Arkansaw Territory, as well as the travellers who have visited those countries, speak in terms of commendation, of a species of Wild Cabbage, which grows wild in those countries, and which bears *red* flowers. Muhlenberg, the *famous* American botanist, in his catalogue of *American* plants, (page 61), has given to it the name of Brassica Washitana. I wish the Society would attempt the introduction, and *civilization* of this plant. From the effects produced by cultivation in other parts of this family, we may expect, in a short period, a number of varieties, and some of them probably very valuable.

[Shall we suffer the Europeans (as they have often done,) to precede us in the cultivation of our own native plants, and to send them back to us in an highly improved state and sometimes even as *novelties?* It does not seem to us to comport with the high stand which we are aiming to take in all the arts. Let us shew what we can make of our own native productions and not receive them improved by the culture, and skill of others.]

"3d. The Capsella bursa pastoris, or common Shepherd's purse (Thlaspi bursa pastoris, English botany 1485) is an escu-

lent plant in Philadelphia, brought to market in large quantities in the early season. The taste, when boiled, approaches that of the Cabbage, but softer and milder. This plant varies wonderfully in size and succulence of leaves according to the nature and state of the soil where it grows. Those from the gardens and highly cultivated spots near Philadelphia come to a size and succulence of leaf scarcely to be believed without seeing them. They may be easily bleached by the common methods and certainly in that state would be a valuable addition to the list of delicate culinary vegetables.

[Note. This plant is very abundant in all the gardens in the vicinity of Boston. If instead of extirpating it early, (for it is among the earliest plants) we should cover it partially with earth and blanch it, it might afford a valuable vegetable, coming in after the dandelion, and before the asparagus.]

"4th. The Hydrophylleum Virginicum is called by the Americans of the Western States, Indian Sallad, or Shawanese Sallad, because the Indians eat it as such while tender. Some of the first settlers do the same. From having tasted it once in Kentucky, I am of opinion that this plant deserves a fair trial of cultivation. (Few persons were better judges of what is palatable than the Abbé de Correa.)

"5th. The Apios tuberosa. (Glycine Apios) which grows wild in many parts of the United States, produces on its roots a number of tuberosities of a good size, and very good taste.

"The Indian and American settlers eat them greedily when they find them, but never to my knowledge have attempted to cultivate them, though in my opinion they deserve a place among our culinary vegetables. I have not the least doubt of their succeeding well in England.

[This plant under the name of ground nut was familiar to our forefathers in New-England. It is rather singular that we have not attempted the cultivation of them. I have met

but with one plant of them, and that I transplanted while it was in flower, and lost it. An ample compensation will be given to any person who shall bring to the subscriber either this autumn, or next spring, two or three dozen roots. I wish to see, if cultivation and care will not enlarge the tubers and improve them.—JOHN LOWELL, Roxbury.]

"6th and 7th. The bulbs of the Quamash (Scilla esculenta) which *Nuttal* makes a species of Phalangium. (Nuttal's Genera of North American plants, page 219), with the tubers of the Psoralia esculenta (Pursh flora Americana Septentrionalis, Vol. II. page 475) are the usual vegetable food of many Indian tribes, and were one of the supports of the people composing the American expedition through the continent to the Pacific Ocean under Captains Lewis and Clarke. Both these plants may probably prove valuable acquisitions; *at all events*, they are fit subjects for the inquiry of the Society. [We add, *still more proper* subjects for the inquiry of an American Agricultural Society.]

"8th. The Indians about Columbia river gather vast quantities of large tubers of an aquatic plant, which, according to the late Professor Barton of Philadelphia, who had seen dried specimens of it brought by Capt. Lewis, is a species of Sagittaria. These tubers are an important part of the diet of these tribes.

"You may see in Osbeck's voyage to China, that similar tubers from a species of Sagittaria grew in the watery places about Canton, and if I well remember are purposely cultivated, turning to profit those naturally unproductive spots.

"Would not this object be worthy of the attention of the Society? If perchance, indications of this nature, directed chiefly to increase the number of useful objects of cultivation meet the indulgence of the Society, I shall feel encouraged to continue this kind of communication.

I am, &c. &c.

JOSEPH CORREA DE SERRA."

NOTE. Unhappily for science this great naturalist did not live to make any further communications. Would it not be practicable, and certainly it would be honourable to those who should do it to bring home some roots of the Esculent Sagittaria of Canton and of the *North West?* All that would be required would be a very tight box. Although an aquatic plant, all the Sagittarias will live and thrive without great moisture. They might be brought to this country, and our national character requires, that we should not let Europe send this native plant to us, as she has done many others.

We hope this purely American article will not be considered as misplaced in our Journal.

REMARKS ON THE PRESENT SYSTEM OF ROAD MAKING; WITH OBSERVATIONS, DEDUCED FROM PRACTICE AND EXPERIENCE. By JOHN LOUDON M'ADAM, Esq.

[The incalculable advantage of good roads to the whole population of a country is not a subject of dispute. The writer who proposes the following article for publication, heard a respectable farmer, who had resided fifty years or more in the vicinity of Boston, assert a short time since, that fuel is now cheaper than it was thirty years ago, and the reason he gave why it should be so was that the roads were so much better, that it had become more of an object to a wider district of country to bring wood to the capital. This greater facility of intercourse, considered in all its bearings on the business of the country—as a cause of greater improvement of the soil, and of increased production—would lead to an estimate of benefit which, though perfectly fair and just, would transcend probably any apparently reasonable conjecture. With all the enterprise, care and cost employed in adding to the number and improving the condition of our roads we are now suffering in common with Great Britain from having been ignorant of "*the science of road making.*" Mr. M'Adam's system is considered in England as the true theory, established to the satisfaction of the public by its application under various circumstances upon several hundred miles of road in different parts of the Kingdom. Some apology might at first seem to be due for the length of this extract. But if any part of it had been omitted the reader would have had to regret the loss of something necessary to a full understanding of M'Adam's plan. The enterprising government of the City of Boston is now engaged in preparing stone for a fair experiment upon some one or more of the streets.]

"BY the improvement of our roads, every branch of our ag-

ricultural, commercial, and manufacturing industry would be materially benefited. Every article brought to market would be diminished in price; the number of horses would be so much reduced, that by these, and other retrenchments, the expense of FIVE MILLIONS would be annually saved to the public. The expense of repairing roads, and the wear and tear of carriages and horses, would be essentially diminished; and thousands of acres, the produce of which is now wasted in feeding unnecessary horses, would be devoted to the production of food for man. In short, the public and private advantages, which would result from effecting that great object, the improvement of our highways and turnpike roads, are incalculable; though from their being spread over a wide surface, and available in various ways, such advantages will not be so apparent as those derived from other sources of improvement, of a more restricted and less general nature."

"The observations I have made in a period of twenty-six years on the roads of the kingdom, in which time I have travelled over the greater number in England and Scotland, and the opportunities I have had of making comparisons on the different materials and the modes of their application, have led me to form the following conclusions.

"1st. That the present bad condition of the roads of the kingdom is owing to the injudicious application of the materials with which they are repaired, and to the defective form of the roads.

"2d. That the introduction of a better system of making the *surface* of roads, and the application of scientific principles, which has hitherto never been thought of, would remedy the evil.

"In illustration of these positions, I beg to observe, that the object to be attained in a good road, as far as regards the surface, is to have it smooth, solid, and so flat as that a carriage may stand upright; these objects are not attained by

the present system, because no scientific principles are applied; but it is presumed they are perfectly attainable in all parts of the country.

"Stone is to be procured in some form in almost every part of the kingdom, and a road made of small broken stone to the depth of ten inches, will be smooth, solid and durable.

"The materials of which the present roads are composed, are not worn out; but are displaced by the action of the wheels of carriages upon stones of too large a size: the wheel does not *pass over* the materials of which the road is formed, but is constantly, almost at every step, encountering an obstacle which must either give way and be removed, or the carriage must be lifted by the force of the cattle so as to surmount it; in either case the road is injured, and the carriage impeded, and the injury and impediment will be great in the exact proportion to the number and size of the obstacles.

"The size of stones for a road has been described in contracts in several different ways, sometimes as the size of a hen's egg, sometimes at half a pound weight. These descriptions are very vague, the first being an indefinite size, and the latter depending on the density of the stone used, and *neither* being attended to in the execution. The size of stone used on a road must be in due proportion to the space occupied by a wheel of ordinary dimensions on a smooth level surface, this point of contact will be found to be, longitudinally about an inch, and every piece of stone put into a road, which exceeds an inch in any of its dimensions, is mischievous.

"The roads in Scotland are worse than those in England, although materials are more abundant, of better quality, and labour at *least* as cheap, and the toll duties are nearly double; this is because road making, that is the surface, is even worse understood in Scotland than in England."

A road ought to be considered as an artificial flooring forming a strong, smooth, solid surface, at once capable of

carrying great weight, and over which carriages may pass without meeting any impediment.*

To the Right Honourable the President, and the Board of Agriculture.

Having communicated to your Honourable Board, some observations on making and repairing roads, in February, 1819, I beg leave to add the following, which have arisen from increased experience on the subject, and also from a

* Other cases of several kinds have occurred where a different method must be adopted, but which it is impossible to specify, and must be met by the practical skill of the Officer whose duty it may be to superintend the repair of a road, and who must constantly recur to general principles. These principles are uniform, however much circumstances may differ, and they must form the guide by which his judgment must be always directed.

When additional stone is wanted on a road that has consolidated by use, the old hardened surface of the road is to be loosened with a pick, in order to make the fresh materials unite with the old.

Carriages, whatever be the construction of their wheels, will make ruts in a new made road until it consolidates, however well the materials may be prepared, or however judiciously applied; therefore a careful person must attend for some time after the road is opened for use, to rake in the track made by wheels.

The only proper method of breaking stones, both for effect and economy, is by persons *sitting;* the stones are to be placed in small heaps, and women, boys, or old men past hard labour, must sit down with small hammers and and break them, so as none shall exceed six ounces in weight.

The Tools to be used are,—

Strong picks, but short from the handle to the point, for lifting the road.

Small hammers of about one pound weight in the head, the face the size of a new shilling, well steeled, with a short handle.

Rakes with wooden heads, ten inches in length, and iron teeth about two and an half inches in length, very strong for raking out the large stones when the road is broken up, and for keeping the road smooth after being relaid, and while it is consolidating.

Very light broad mouthed shovels, to spread the broken stone and to form the road.

Every road is to be made of broken stone without mixture of earth, clay, chalk, or any other matter that will imbibe water, and be affected with frost; nothing is to be laid on the clean stone on pretence of *binding;* broken stone will combine by its own angles into a smooth solid surface that cannot be effected by vicissitudes of weather, or displaced by the action of wheels, which will pass over it without a jolt, and consequently without injury.

desire of calling your attention to the effects of the late severe winter on the roads of the country, and the confirmation afforded to the opinions I have endeavoured to introduce on the construction of roads.

During the late winter, and particularly in the month of January, 1820, when the frost was succeeded by a sudden thaw, accompanied by the melting of snow, the roads of the kingdom broke up in a very alarming manner, and to an extent that created great loss and inconvenience by the interruption of communication, and the delay of the mails, and also occasioned a very heavy extra expenditure by the Post-office.

The obvious cause of this defect of the roads, was the admission of water from the loose and unskilful method of their construction. Previous to the severe frost, the roads were filled with water, which had penetrated through the ill-prepared and unskilfully laid materials: this caused an immediate expansion of the whole mass during the frost, and upon a sudden thaw, the roads became quite loose, and the wheels of carriages penetrated to the original soil, which was also saturated with water, from the open state of the road. By this means, many roads became altogether impassable, while the whole were rendered deep, and inconvenient to be travelled upon.

Of all the roads which have been thoroughly re-made, according to the directions which I had the honour to submit to your honourable Board last spring, not one has given way, nor has any delay taken place through the severity of the late season.

As every winter has, in some degree, presented such inconveniences, and as it has been observed that very severe winters occur in England every six or seven years, it is of great consequence to consider of the means of constructing the roads of the kingdom in such a manner as shall prevent their being in future effected by any change of weather or season.

The roads can never be rendered thus perfectly secure, until the following principles be fully understood, admitted, and acted upon: namely, that it is the native soil which really supports the weight of traffic: that while it is preserved in a dry state, it will carry any weight without sinking, and that it does in fact carry the road and the carriages also; that this native soil must previously be made quite dry, and a covering impenetrable to rain, must then be placed over it, to preserve it in that dry state; that the thickness of a road should only be regulated by the quantity of material necessary to form such impervious covering, and never by any reference to its *own* power of carrying weight.

The erroneous opinion so long acted upon, and so tenaciously adhered to, that by placing a large quantity of stone under the roads, a remedy will be found for the sinking into wet clay, or other soft soils, or in other words, that a road may be made sufficiently strong, *artificially*, to carry heavy carriages, though the sub-soil be in a wet state, and by such means to avert the inconveniences of the natural soil receiving water from rain, or other causes, has produced most of the defects of the roads of Great Britain.

At one time I had formed the opinion that this practice was only a useless expense, but experience has convinced me that it is likewise positively injurious.

It is well known to every skilful and observant road-maker, that if strata of stone of various sizes be placed as a road, the largest stones will constantly work up by the shaking and pressure of the traffic, and that the only mode of keeping the stones of a road from motion, is to use materials of a uniform size from the bottom. In roads made upon large stones as a foundation, the perpetual motion, or change of the position of the materials, keeps open many apertures through which the water passes.

It has also been found, that roads placed upon a hard bottom, wear away more quickly than those which are placed

upon a soft soil. This has been apparent upon roads where motives of economy, or other causes, have prevented the road being lifted to the bottom at once; the wear has always been found to diminish, as soon as it was possible to remove the hard foundation. It is a known fact, that a road lasts much longer over a morass than when made over rock. The evidence produced before the Committee of the House of Commons, shewed the comparison on the road between Bristol and Bridgwater, to be as five to seven in favour of the wearing on the morass, where the road is laid on the naked surface of the soil, against a part of the same road made over rocky ground.

The practice common in England, and universal in Scotland, on the formation of a new road, is, to dig a trench below the surface of the ground adjoining, and in this trench to deposit a quantity of large stones; after this, a second quantity of stone, broken smaller, generally to about seven or eight pounds weight; these previous beds of stone are called the bottoming of the road, and are of various thickness, according to the caprice of the maker, and generally in proportion to the sum of money placed at his disposal. On some new roads, made in Scotland, in the summer of 1819, the thickness exceeded three feet.

That which is properly called the road, is then placed on the bottoming, by putting large quantities of broken stone or gravel, generally a foot or eighteen inches thick, at once upon it.

Were the materials of which the road itself is composed, properly selected, prepared, and laid, some of the inconveniences of this system might be avoided; but in the careless way in which this service is generally performed, the road is as open as a sieve to receive water; which penetrates through the whole mass, is received and retained in the trench whence the road is liable to give way in all changes of weather.

A road formed on such principles has never effectually answered the purpose which the road-maker should constantly have in view; namely, to make a secure, level flooring, over which carriages may pass with safety, and equal expedition, at all seasons of the year.

If it be admitted, as I believe it is now very generally, that in this kingdom an artificial road is only required to obviate the inconvenience of a very unsettled climate; and that water with alternate frost and thaw, are the evils to be guarded against, it must be obvious that nothing can be more erroneous than providing a reservoir for water under the road and giving facility to the water to pass through the road into this trench, where it is acted upon by frost to the destruction of the road.

As no artificial road can ever be made so good, and so useful as the natural soil in a *dry state*, it is only necessary to procure, and preserve this dry state of so much ground as is intended to be occupied by a road.

The first operation in making a road should be the reverse of digging a trench. The road should not be sunk below, but rather raised above, the ordinary level of the adjacent ground, care should at any rate be taken, that there be a sufficient fall to take off the water, so that it should always be some inches below the level of the ground upon which the road is intended to be placed: this must be done, either by making drains to lower ground, or if that be not practicable, from the nature of the country, then the soil upon which the road is proposed to be laid, must be raised by addition, so as to be some inches above the level of the water.

Having secured the soil from *under* water, the road-maker is next to secure it from rain water, by a solid road, made of clean, dry stone, or flint, so selected, prepared, and laid, as to be perfectly impervious to water: and this cannot be effected, unless the greatest care be taken, that no earth, clay, chalk, or other matter, that will hold or conduct water,

be mixed with the broken stone; which must be so prepared and laid, as to unite by its own angles into a firm, compact, impenetrable body.

The thickness of such road is immaterial, as to its strength for carrying weight; this object is already obtained by providing a dry surface, over which the road is to be placed as a covering, or roof, to preserve it in that state: experience having shewn, that if water passes through a road, and fill the native soil, the road, whatever may be its thickness, loses its support, and goes to pieces.

In consequence of an alteration in the line of the turnpike road, near Rownham Ferry, in the parish of Ashton, near Bristol, it has been necessary to remove the old road. This road was lifted and relaid very skilfully in 1816; since which time it has been in contemplation to change the line, and consequently, it has been suffered to wear very thin. At present it is not above three inches thick in most places, and in none more than four: yet on removing the road it was found, that no water had penetrated, nor had the frost affected it during all the late winter; and the natural earth beneath the road was found perfectly dry.

Several new roads have been constructed on this principle within the last three years. Part of the great north road from London by Hoddesdon in Hertfordshire—two pieces of road on Durdham Down, and at Rownham Ferry, near Bristol—with several private roads, in the eastern part of Sussex.

None of those roads exceed six inches in thickness, and although that on the great north road is subjected to a very heavy traffic, (being only fifteen miles distant from London) it has not given way, nor was it effected by the late severe winter; when the roads between that and London became impassible, by breaking up to the bottom, and the mails and other coaches were obliged to reach London by circuitous routes. It is worthy of observation, that these bad roads cost more money per mile for their annual repair, than the original making of this useful new road.

Improvement of roads, upon the principle I have endeavoured to explain, has been rapidly extended during the last four years. It has been carried into effect, on various roads, and with every variety of material, in seventeen different counties. These roads being so constructed as to exclude water, consequently none of them broke up during the late severe winter; there was no interruption to travelling, nor any additional expense by the Post-office in conveying the mails over them, to the extent of upwards of one thousand miles of road.

Many new roads, and to a considerable extent, are projected for the ensuing season. Some of them are to be assisted by grants or loans from government, and it will be a great saving of property, and enable government to extend their assistance more effectually, if these roads be made in the most approved and economical manner.

The measure of substituting pavements, for convenient and useful roads, is a kind of desperate remedy to which ignorance has had recourse. The badness, or scarcity of materials, cannot be considered a reasonable excuse; because the same quantity of stone required for paving, is fully sufficient to make an excellent road any where: and it must be evident, that road materials of the best quality may be procured at less cost than paving stone.

The advantages of good roads, when compared with pavements, are universally acknowledged; the extension of pavement is therefore to be deprecated as an actual evil, besides the greatness of the expense. Pavements are particularly inconvenient and dangerous on steep ascents, such as the ascent to bridges, &c. A very striking example of this may be observed on the London end of Black-friars Bridge where heavy loads are drawn up with great difficulty, and where more horses fall and receive injury, than in any other place in the kingdom. The pavement in such places should be lifted, and converted into a good road; which may be done

with the same stone, at an expense not exceeding ten-pence per square yard. This road would be more lasting than the pavement, and, when out of order, may be repaired at less than one tenth of the expense which relaying the pavement would require.

This measure has been adopted with great success, and considerable saving of expense, in the suburbs of Bristol, where the pavements were taken up, and converted into good roads, about three years ago.

The advantages of the system recommended is so obvious to common observation in the repair of old roads, and has been practised to an extent so considerable, during the last four years, that the minds of most people have become reconciled to it; and objections, founded on old prejudice and suspicion, have given way to experience, but the application of the same principles to the construction of new roads, has necessarily been much more limited. It will, therefore, require more liberality and confidence on the part of country gentlemen, and also more patient investigation of the principles on which the system is founded, before they will allow of its adoption on new lines of road. It is to be hoped, however, that the importance of the subject will recommend it to general consideration.

Mr. John Loudon M'Adam having for many years directed his attention, as a magistrate and a commissioner to the improvement of roads, was induced to accept the situation of general surveyor of an extensive trust round the city of Bristol.

The admirable state of repair into which the roads under his direction were brought, attracted very general attention; and induced the commissioners of various districts to apply for his assistance or advice.

The general testimony borne to his complete success wherever he has been employed, and the proof that his im-

provements have been attended with an actual reduction of expense, while they have afforded the most useful employment to the poor, induce your Committee to attach a high degree of importance to that which he has already accomplished. The imitation of his plans is rendered easy by their simplicity, and by the candour with which he has explained them, though ability in the surveyor to judge of their application must be understood as an essential requisite.

Your Committee have dwelt on this improved system of making roads, as a preliminary consideration to any alteration of the laws, being persuaded that it is of essential importance to adapt the law to new circumstances; that the first step requisite is to take effectual measures for ensuring the *formation* of good roads; and that their preservation afterwards, if proper principles for their repair be once adopted, will require fewer legislative regulations than former inquiries have deemed necessary.

[Reference is made to the following minutes of evidence taken by a Committee of the House Commons.]

John Loudon M'Adam, Esq. called in; and Examined.

I believe Mr. M'Adam, you reside in Bristol?—Yes, I do.

And have under your care a considerable district of the turnpike roads in that neighbourhood?—Yes, about one hundred and eighty miles of road in that neighbourhood.

How long has your attention been particularly directed to the state of the public roads of the kingdom generally, and the means of their improvement?—About twenty-five years.

Are you a professional civil engineer?—No.

Be pleased to state to the Committee the general state of the turnpike roads at the time you first directed your attention to them, about twenty years ago?—I think the state of the roads twenty years ago, was worse generally than at present, and in particular places much worse. If the Committee would indulge me, I would mention what first led me to these considerations. On my first arriving from America in the year 1783, at the

time the roads were making in Scotland (where, at that time the Turnpike Acts being in operation about twenty years) very many of their roads were unmade. I was then appointed a commissioner of the roads, and had occasion in that capacity to see a great deal of road-work.

Where?—In Scotland. This first led me to inquire into the general method of road-making, and the expense of it. Since that period, I have been mostly in Bristol, where I was also appointed a commissioner of the roads; the very defective state of which could not fail to attract my attention. I was induced to offer myself to the commissioners, to take charge of the roads as a surveyor, because I found it impossible for any individual commissioner to get the roads put into a situation of being mended with any prospect of success; and no individual could incur the expense of making experiments on a great scale. The roads of Bristol were accordingly put under my direction in the month of January 1816.

That was when you were appointed surveyor?—Yes, I have travelled at various times, during the last twenty years, to ascertain which are the best roads, and which the best means of road-making over the whole kingdom, from Inverness in Scotland to the Land's End in Cornwall. I have obtained all the information that an unauthorised person could expect to receive. In the course of travelling through the country, I have generally found the roads in a very defective state, certainly much worse in particular parts of the country than in others; and in particular counties I have found some parts of the roads much worse than in other parts of the same county. The defects of the roads appear to me to proceed from various causes, but principally from the large use of a mixture of clay and chalk and other matters, that imbibe water, and are affected by frost. Such roads become loose in wet weather, so as to allow the wheels of carriages to displace the materials, and thereby occasion the roads to be rough and rutty. More pains, and much more expense, have been bestowed on the roads of late years, but without, in my opinion, producing any adequate effect, from want of skill in the executive department.

Does the superiority of roads, in certain places that you have mentioned, arise from their better materials in those neighbourhoods?—No: the same material is found in many parts of the kingdom with much worse roads.

Then, in general, you impute the badness of the roads solely to the applying of the materials?—Yes.

And also to the formation of the roads?—That I consider as part of the application of the materials.

Has there prevailed of late years a general spirit of improvement, in different parts of the country, with regard to the roads?—I think there has, and particularly in the west country.

From the experience you have had in the improvements that have taken place, have you found that these have been attended generally with an increase or diminution of expense?—In general the expense must be diminished by the improvements.

Have you found that a similar diminution of expense has taken place where the materials have been bad as where they have been good?—Yes, I have.

Do you find your mode of management equally applicable where the materials are bad as where they are good, and that the same proportionable benefit arises?—I am afraid gentlemen suppose that I have some particular mode of management, which is certainly not the case, nor can by any means be the case; and in every road I have been obliged to alter the mode of management, according to the situation of the roads, and sometimes according to the finances.

In the formation of roads under your management, to what shape do you give the preference: I allude to the convex shape or the flat?—I consider a road should be as flat as possible with regard to allowing the water to run off at all, because a carriage ought to stand upright in travelling as much as possible. I have generally made roads three inches higher in the centre than I have at the sides, when they are 18 feet wide; if the road be smooth and well made, the water will run off very easily in such a slope.

Do you consider a road so made will not be likely to wear hollow in the middle, so as to allow the water to stand, after it

has been used for some time?—No; when a road is made flat, people will not follow the middle of it as they do when it is made extremely convex. Gentlemen will have observed that in roads very convex, travellers generally follow the track in the middle, which is the only place where a carriage can run upright, by which means three furrows are made by the horses and the wheels, and the water continually stands there: and I think that more water actually stands upon a very convex road than on one which is reasonably flat.

In what way do you make the watercourses at the sides of the road; I ask that question, having observed the farmers, in exercising their power of cleaning out their ditches, dig them to such a depth as to render them dangerous to be passed at night? —I always wished the ditch to be so dug as that the materials of the road should be three or four inches above the level of the water in the ditch, and to that point we endeavour to bring the farmers, but they are very unwilling to clean the ditches at any time when called upon, and when they do it, if they find vegetable mould in any quantity at the bottom of the ditch, they will prosecute their inquiry much deeper than is useful, or proper for safety.

What depth of solid materials would you think it right to put upon a road, in order to repair it properly?—I should think that ten inches of well consolidated materials is equal to carry anything.

This is, provided the substratum is sound?—No; I should not care whether the substratum was soft or hard; I should rather prefer a soft one to a hard one.

You don't mean that you would prefer a bog?—If it was not such a bog as would not allow a man to walk over, I should prefer it.

What advantage is derived from the substrata not being perfectly solid?—I think, when a road is placed upon a hard substance, such as a rock, the road wears much sooner than when placed on a soft substance.

But must not the draught of a carriage be much greater on a road which has a very soft foundation, than over one which is of

a rocky foundation?—I think the difference would be very little indeed, because the yield of a good road on a soft foundation, is not perceptible.

To use the expression to which you have alluded, as being used by the coachmen, would a carriage run so true upon a road, the foundation of which was soft, as upon one of which the foundation was hard?—If the road be very good, and very well made, it will be so solid, and so hard, as to make no difference. And I will give the Committee a strong instance of that, in the knowledge of many gentlemen here. The road in Somersetshire, between Bridgewater and Cross, is mostly over a morass, which is so extremely soft, that when you ride in a carriage along the road, you see the water tremble in the ditches on each side; and after there has been a slight frost, the vibration of the water from the carriage on the road, will be so great as to break the young ice. That road is partly in the Bristol district. I think there is about seven miles of it, and at the end of those seven miles, we come directly to the limestone rock. I think we have about five or six miles of this rocky road immediately succeeding the morass; and being curious to know what the wear was, I had a very exact account kept, not very lately, but I think the difference is as five to seven in the expenditure of the materials on the soft and hard.

Do you mean seven on the hard and five on the soft?—Yes.

And yet the hard road is more open to the effect of the sun and air than the soft road?—It certainly lies higher.

But in forming a road over a morass, would you bottom the road with small or large stones?—I never use large stones on the bottom of a road; I would not put a large stone in any part of it.

In forming a road across a morass, would you not put some sort of intermediate material between the bog and the stone?—No, never.

Would you not put faggots?—No, no faggots.

How small would you use the stones?—Not to exceed six ounces in weight.

Have you not found that a foundation of bog sinks?—No, not a bit of the road sinks; and we have the same thickness of materials on the one as on the other.

If a road be made smooth and solid, it will be one mass, and the effect of the substrata, whether clay or sand, can never be felt, in effect by carriages going over the road; because a road well made, unites itself into a body like a piece of timber or a board.

In making a road under these circumstances, do you make the whole of the depth of materials at once?—No, I prefer making a road in three times.

Three different times?—Yes.

To what size would you break the hard materials?—To the size of six ounces weight.

Do you conceive that a more scientific system of management of roads is wanted universally?—I do.

Do not you conceive that the want of this scientific system leads to a great waste of public money?—I think it leads to a great waste of public money.

And also to a great waste of property in horses and carriages?—I think it does.

Has any estimate ever been made of the extent of that loss?—There can be no accurate estimate of a loss so universal as that of the waste of horses and carriages by bad roads; but the Committee of 1811 estimating the saving which would be made to the country by putting the roads in a proper state of repair, at a sum equal to five millions annually.

RIGA FLAX SEED.

Letter from the Hon. T. H. Perkins.

[To the Corresponding Secretary.]

February 26, 1824.

Dear Sir,

When in Ireland the last summer, I conversed with some of the venders of Flax seed, from whom I learned, that the growers of Flax preferred the seed from Riga before that of any other country—after that, the seed of Holland; and last

of all, what came from the United States;—of this last, the seed from the *State of New-York* had the preference. Upon inquiry I found that the Dutch seed was preferred from being more clean from tares than ours, and that the inspection was more attended to in *the State of New-York* than in Massachusetts—the whole import into Ireland, was 54,666 casks, of which 41,854 came from the United States, 10,882 from Holland, from Riga 2000 casks. The Riga seed commands in ordinary seasons 20 to 30*l.* sterling more than the Dutch seed, and the latter 10 to 15*l.* more than ours. An improvement had been made of sowing in the autumn, in place of the spring, as had been usual. On the 6th July I saw flax at Belfast, which had been sowed in October four feet and an inch in length—this I understood was from Riga seed. Believing that it might be of some importance to test the advantage of using the Riga seed, I requested the American Consul, Samuel Luke, Esq. to find me a cask of Riga seed, which has arrived at New-York, and is ordered here. It is at the service of the Massachusetts Agricultural Society. I wish, however, a portion of it to be reserved for my friend Gen. Derby, who resides at Londonderry, where I understand Flax is extensively cultivated—the remainder is at your service for distribution, and I hope it may prove a useful experiment.

Respectfully, Dear sir,

Your friend and servant.

T. H. PERKINS.

LONG WOOLLED SHEEP OF THE NETHERLANDS.

Letter from the Hon. T. H. Perkins.

[To the Corresponding Secretary.]

Boston, March 16, 1824.

SIR,

I HAVE imported from the Kingdom of the Netherlands, a Buck and two Ewes of the long woolled Sheep of that coun-

try, which I hold at the disposition of the Agricultural Society. The staple of this wool on the full grown Sheep is fourteen inches in length, and as the carcase of the sheep is large, the fleece will be found to be large, in proportion to ours. Believing that this breed of Sheep would be useful to our country, and disposed to add my mite to promote the views of the Society, I hope they may be found to be acceptable to the Trustees. I am, Respectfully,

Your obedient Servant.

T. H. PERKINS.

The animals presented by the Hon. T. H. Perkins to the Massachusetts Agricultural Society were gratefully accepted, as a highly valuable acquisition to our stock of sheep. The propagation of this race is important to the progress of the manufacture of blankets and worsteds, in our country. The Sheep are now in charge of Mr. Enoch Moody of Byfield, in the county of Essex, with whom they will remain a year or more.

ON LINSEED OIL FOR FATTING CATTLE.

[To the Corresponding Secretary.]

Roxbury, May 7th, 1824.

DEAR SIR,

In the spring of 1818 I purchased a large fine looking Cow, from the high recommendation of her former owner, as to her valuable milk properties; in a few days after she calved, and her bag was in so bad a state as made it necessary very soon to dry her up, losing the whole object for which I purchased her. Early in the fall having read, in "*Varlo* on Husbandry," published by an English Farmer in this country about 40 years ago, a Receipt as follows: "The quickest feeding a beast can take is *linseed oil* mixed with bran, if the animal is small, give two pecks of bran per day, divided into

three feeds, in each peck half a pint of oil, they eat it very greedily and it feeds them wonderfully fast; they must have what hay they will eat, but that will not be much. The oil dilutes all the rest of the food they eat, and as to itself, it all stays in the beast, as fat, five gallons and the bran in proportion will fatten a beast sooner than five pounds sterling in any other food."

I felt determined to try the experiment on the above mentioned cow—She refused the food for two days, but finding she had none other offered, she afterwards began to eat, and in a short time became fond of it; she increased in fatness very fast. After using the 5 gallons recommended, I purchased two more, and then for about a fortnight gave her Indian meal, when she was in high order. And I sold her to a neighbouring Butcher, (having described to him the manner of feeding,) at nine dollars the hundred pounds, being the price of the very best beef at that time, the weight paid for was seven hundred and ninety four pounds. I never saw handsomer marbled meat, and he told me his customers were very much pleased with it; and he has very frequently since told me they have often spoken of the goodness of that beef.

Two years after I fatted a pair of Oxen, one of which was by the same mode, consuming eight or nine gallons of oil, and afterwards meal for two or three weeks; the other on vegetables and meal. I sold them to a Butcher from Halifax, Nova Scotia, for that market; they were estimated at 1200 lbs. each—the oil fed one was thought the best, and the expense of feeding was considerably less. I gave this man notice of the mode of fatting both animals, he said he had no objection to the oil, as in England their cattle are fed largely on *oilcake*, and he should *bleed* this animal a few days before slaughtering. I heard from Halifax that the meat of both was considered excellent. Since then I have not fatted any beef animals, but was so well satisfied, that whenever I do I shall adopt the same method.

Mr. Parsons intends this season, fatting an animal by this method, when he will give the result to the society.

I am dear Sir,

Respectfully yours,

JOHN PRINCE.

The oil cake, and linseed, ground to a powder, as well as the oil are much used for fatting cattle in England. The enriching of the manure by this means is said to be a sufficient object, were there no advantage in the first cost of the food. A jelly is likewise made from the linseed and mixed with barley meal or with bran and cut chaff.*

There is said to be danger of giving a yellow tinge to the fat by keeping animals a long time on the oil or the cake.

Marshall in noticing the practice in the District of Maidstone, England, of grinding the seed for fodder says—"in the state of powder, it has no degree of clamminess and very little of tenacity; being perfectly dry, with an appearance like ground coffee. It might be perfectly or sufficiently mixed with the flour of pulse or any grain." He recommends this preparation as preferable either to the oil or cake.†

* Linseed Jelly. The principal objection to this material is the trouble of preparing it. In an instance in which it was used with success, the method of preparing it was this. The proportion of water to seed was about seven to one. Having been steeped in part of the water, eight and forty hours, previously to the boiling, the remainder was added cold; and the whole boiled gently about two hours; keeping it in motion during the operation, to prevent its burning to the boiler; thus reducing the whole to a jelly like or rather a gluey or ropy consistence; cooled in tubs. Each bullock being allowed about two quarts of jelly per day or somewhat more than one quart of seed, in four days; that is about one sixteenth of the medium allowance of oil cake.—*Marshall's Gloucestershire, &c.*

† A large part of the flax seed which comes to the Boston market, is raised in New Hampshire and Maine, and most of what is grown within this state is produced in the southern counties.

ON THE MANUFACTURE OF STRAW HATS.

[From the London Mechanics' Weekly Journal.]

[It will be recollected that a Miss Woodhouse of Wethersfield, in Connecticut, sent out to England in 1821, a bonnet of very fine manufacture, made from a grass growing in our fields (*poa pratensis.*) The straw plait was observed to be finer than a very fine specimen of Italian plait imported from Leghorn. Of several parcels of bonnet straw received in England from Italy, lately, some of them were recognised to be common grasses, and some of them oats, wheat and rye. It has been heretofore generally supposed that a particular kind of wheat straw was the only material used in the manufacture of the finest Leghorn bonnets, and that for want of this we could never manufacture bonnets equal in fineness and beauty to those imported. It appears now that this is not the case, and our countrywomen, we hope, will find themselves prepared to take advantage of any useful hints in the following account of the process in use in Italy.]

THE Italian plait is said to be fine, when fourteen or more sewn together do not exceed four inches in breadth; they are called coarse if there are a less number than fourteen in the same breadth; but the manufacture of both is exactly the same.

The straw having commonly a more or less deep shade, it must first be bleached. For this purpose it is sometimes tied up in bundles, dipped in boiling water, untied and spread out to dry; if not yet white enough, it is put into a small closet or box, and some lighted brimstone being also put into the place, at a distance from the straw, the closet is shut up close for some hours. The bleached straw is then placed between two very damp coarse cloths, and left for three or four hours, that it may become sufficiently moist to be supple.

This being done, the knots are cut off, and the straw, unless it is to be used whole, is split lengthways by the point of a penknife, into three or four parts; they are then moistened again that they may be flattened, and form as it were little ribands; and are then, after being kept flat for three or four hours, ready to be plaited.

The plaiting is performed by the hand. It requires much attention, not only for the closeness but the regularity of the work. The female who plaits must keep her fingers constantly moist for otherwise the straw would lose its suppleness and flexibility.

In order to make extraordinarily fine straw hats, the straws are divided into a greater number of strips; but then the point of a knife can no longer be used. This division is performed in Italy by means of a row of very small fine needles, such as are used to embroider upon muslin; they are kept in their place by their heads being connected by rosin. On passing a strip of straw, (after it has been divided by the knife, and flattened,) between these needles, it is divided into several strips, much smaller than before, but not so fine as the strips of straw used for making flowers and other ornaments, which are divided in the same manner. The plait being thus made of a proper breadth and length, according to the work for which it is designed, is delivered to other workwomen, who sew it together by forming it into a spiral, and sewing the edges together, either merely touching one another or overlapping.

However well the plaiting of these hats is executed, they require to receive a finishing, which may give them an even brilliancy and regularity of surface. There are two methods for giving this final dressing to these hats:—the use of a press, and that of passing a heated iron over them.

For the purpose of pressing the hats, the plait is moistened either with rice-water, very thin starch, or weak gum-water, and dried; after which the hats are piled one upon another, with boards placed between each, the boards being previously well warmed; and the whole is strongly pressed, and left in the press for several hours, generally a day and night. The edges are first pressed, then the sides of the crown, and lastly the top of the crown.

The process with the hot smoothing iron is much quicker; the hat is dressed with the mucilaginous dressing as in the other method, and is then run over with a heated smoothing iron of a proper shape, or with an iron box, containing either a mass of heated iron or a charcoal fire. Machines have been invented to accelerate the work.

ON DEAD LIME.

[From the London Mechanics' Weekly Journal.]

It has long been observed by lime burners, that if lime stone is imperfectly burnt in the first instance, no further exposure of it to fire will produce quick lime; but the philosophical chemists have doubted the truth of this observation. Mr. Vicat in a work however, which he has lately published upon mortar and stucco, has confirmed the observation of the lime burners. He found that in making quick lime in a small furnace, if the small pieces of lime stone which fell through the grate into the ash pit, before they were thoroughly burnt, were collected and again put into the fire, even for several successive times, quick lime was not obtained but a kind of lime technically called dead lime, which will not slake with water; but which upon being ground and made into a paste with water, differs from common mortar by setting under water. When chalk is burnt, and the lime left to fall into powder by long exposure to the air, and then made into a stiff paste with water, it sets very sensibly under water; so that the action of the air seems to produce a dead lime, similar to that produced by the incomplete burning of lime stone, as being neither pure quick lime, nor a complete carbonate of lime, but a kind of sub-carbonate, which possesses the new and useful property of setting under water.

Mr. Raucourt De Charleville observed the same effects to be produced as are described by Mr. Vicat. He also made

another observation respecting the production of a cement which sets under water. He had prepared a mixture of quick lime and clay and left it to dry; some of this was then broken into small pieces, and burnt on a heated cast iron plate; and another parcel in a small furnace, mixed with the charcoal used as fuel.

In these experiments it was observed that the pieces of this mixture of quick lime and clay, which were burnt on the heated plate, produced mortar that set under water; but those burnt mixed with charcoal, produced a mortar which did not set under water.

Mr. Clement, when he gave an account of a mineral found by Mr. Minard in France, and which was fit for the making of hydraulic mortar or Roman cement, stated it to be Mr. Minard's opinion, that the cause of the Roman cement setting under water, was owing to a sub-carbonate of lime produced by the action of fire on the natural carbonate, as the chemists say, or in other words, to imperfect lime.

EXPERIMENTS IN REAPING BARLEY, AT DIFFERENT STAGES IN ITS PROGRESS TOWARDS RIPENESS.

[From the Farmer's Magazine, published in England.]

Some observations lately circulated by Sir John Sinclair, regarding the stage at which it is proper to apply the sickle to corn crops led to an experiment, of which the following is a detail.

A particular spot, in a field of barley having been selected for the trial, twenty-four stalks of grain, all as nearly as possible of the same size and state of advancement, were cut close by the ground, at different periods; and each parcel being tied up and labelled, was suspended in a room. The following were the dates of reaping and the appearance of the plants when cut:

Aug. 11th.—1st. 24 stalks. The ear pretty well filled, but soft and quite green.

Aug. 18th.—2d. 24 stalks. The ear full and plump, but still green—grain soft and pulpy.

Aug. 25th.—3d. 24 stalks. The grain doughy, and no longer to be separated from the husk by pressure of the fingers.

Sept. 1st.—4th. 24 stalks. Grain still soft and doughy.

Sept. 6th.—5th. 24 stalks. The grain still soft and easily crushed between the finger and thumb.

Sept. 11th.—6th. 24 stalks. Grain still soft; but the field on the whole, in a state of ripeness, commonly esteemed sufficient; and accordingly this day it was begun to be reaped.

On the 10th of October, by which time the parcels were properly dried, the grain was carefully rubbed out, and subjected to an operation, equivalent to a complete winnowing.

The produce of No. 1, was found shrivelled and imperfect. And that of No. 2, little if at all superior.

With regard to these two parcels, they were cut when with a view to weight of grain reaping would be improper. It is presumable from their appearance, they would both vegetate; and it may be desirable to ascertain whether barley, reaped in the state of either of these parcels, might safely be used as seed; because if so, an evident advantage would arise from the additional value which the consequent preservation of its juices would give to the straw, while, perhaps, as seed the grain might go as far as when perfectly ripened.

The produce of No. 3, was also defective, being what is termed hungry; but not upon the whole unmarketable.

Nos. 4 and 5 had the appearance of maturity, but contained more light grain than No. 6.